JANUARY 1956 • $1.00

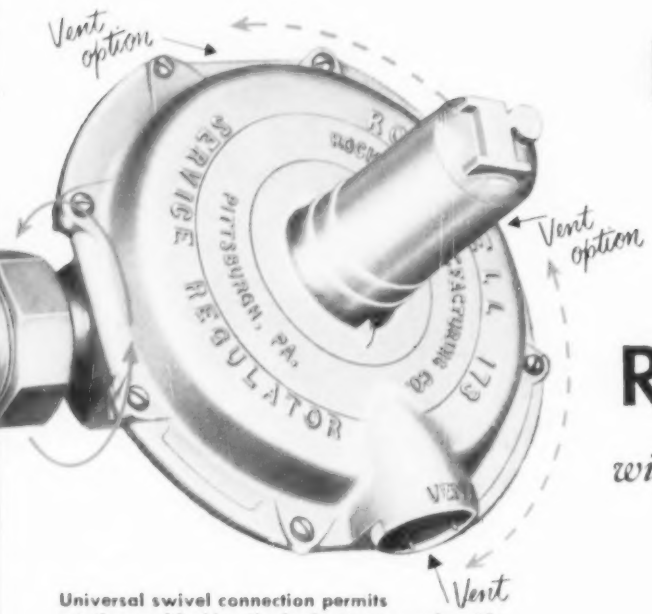
GAS

ENGINEERING • UTILIZATION • PIPELINES • MANAGEMENT

A DECADE OF PROGRESS

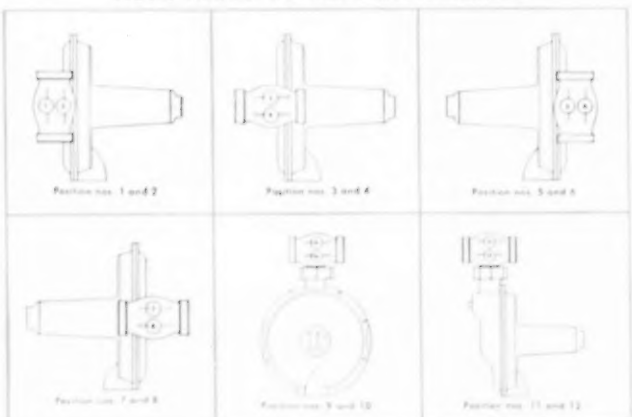
A report on the 10 years since the war

Versatile is the word for...



Universal swivel connection permits rotating and locking the body at any angle with the pipe. The cover can be detached and turned so that the vent always drains downward.

ADAPTABLE TO ANY MOUNTING



Rockwell "173" Service Regulators

with Down Drain Cover

Here's new ease and convenience in service regulator installation, particularly on difficult jobs such as pressure elevation.

There are 12 standard factory assembly positions available (see diagrams). Thereafter, the diaphragm case can be rotated to any position by simply loosening the swivel nut. Such versatility in application eliminates the problem of stocking right and left-hand assemblies or top and bottom inlet models. For full description of this and other Rockwell service regulators write for bulletin 1026.

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Pittsburgh 8, Pa.

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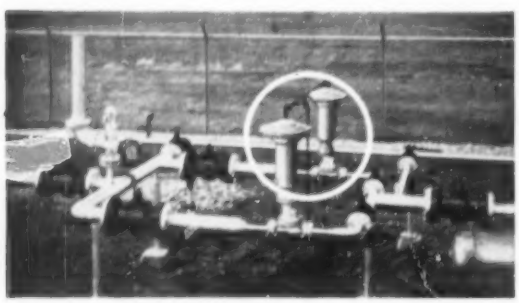
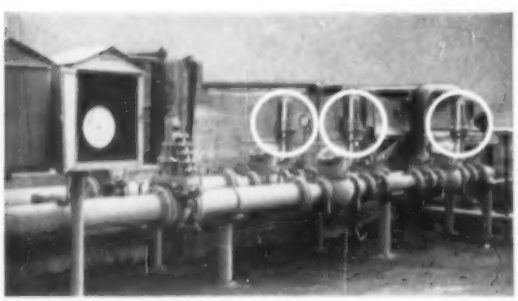
Over 50 years of Regulator development and service to the Gas Industry have made RELIANCE REGULATORS the most *advanced* in design and the most *efficient* in operation. This abundance of experience provides extra assurance that your REGULATOR requirements are in good hands. Lower maintenance costs are *built* into each RELIANCE unit to provide versatility and top performance with extreme simplicity. Let a RELIANCE REGULATOR specialist show you how this unvarying quality means efficiency, safety and economy.



RELIANCE equipped large field processing installation.



RELIANCE equipped distribution system.

For sustained gas regulation accuracy at lower costs —*You can rely on RELIANCE REGULATORS.* For complete engineering data, request Bulletins

C&V High Pressure Regulators —direct connected series.

C&V High Pressure Regulators —offset conected series for easy accessibility.

HPH For sensitive regulation and positive lockup.

HPR High Pressure Regulator series—inlet pressures up to 1000 psi and outlet pressures from 2.5 to 350 psi.

NR Primary or secondary unit equipped with internal relief valve.

AMERICAN® METER COMPANY
INCORPORATED (ESTABLISHED 1836)

RELIANCE REGULATOR DIVISION
ALHAMBRA, CALIFORNIA

TO MINIMIZE TRAFFIC INTERFERENCE on busy Belmont Boulevard, two cuts at a time are being made on long job of replacing clamps on Nashville, Tenn. gas mains. The cuts (30″ sq. and 26″ average depth) are backfilled immediately with hot mix tamp. The compressor used is a Jaeger Air-Plus Roto® "125" because it has the capacity to run both breakers at full efficiency yet is easily trailed and light enough to spot by hand.

BACKFILLING 7 MILES OF TRENCH, A. J. Ellis Construction Co., College Park, Md. are here using a Jaeger Roto "125" with a triplex tamper. Job is laying 35,000′ of 24″ gas transmission line for Washington Gas Light Co. User reports: "We liked our first Jaeger Rotary so well we bought two more."

Jaeger 125 Rotary speeds your street work

With a Jaeger 125 "Roto" you have *constant* 100 lbs. pressure under all air demands up to 125 cfm—enough to run two 80 lb. breakers at top efficiency. You have tool boxes that hold a full set of tools. You have a machine that's easier to trail and spots by hand. And you have the most efficient rotary compressor unit built, producing air at slower engine speeds, low temperatures and with fuel economy that is money in the user's pocket.

Jaeger Rotaries are also available in 365 and 600 cfm sizes, for larger work. For complete information or demonstration, see your Jaeger distributor — or send for latest Catalog JCR5.

Model "600" Air-Plus Roto — 600 cfm at 100 psi

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GAS

32nd YEAR OF PUBLICATION

IN THIS ISSUE . . . .

Ten years can bring more changes than one would think possible on only brief reflection. The decade since the war has brought more than its share in every sort of endeavor; in the gas industry, the changes have been particularly marked. In many ways it has been a real "Golden Age" of progress. Some of these ways are commented on in this issue, which commemorates an interesting and memorable era in the industry.

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BPA

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1 GAS TIGHT "O" ring seals at top and bottom of key offer absolute assurance against leakage to the atmosphere. The precisely ground key is lapped into the stop body, preventing leakage through the port when the stop is closed.

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3 TAMPERPROOF Heavy bronze washer is secured to the lower end of the stem with a blind pinned key. The original factory adjustment is retained even if the nut threads are stripped or if nut is removed from stem.

These and other advanced features of the Mueller Lub-O-Seal gas meter stop can help you eliminate meter stop replacement. Consult your Catalog G-97, your Mueller Representative or write direct for complete information.

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H-11175 Lock Wing
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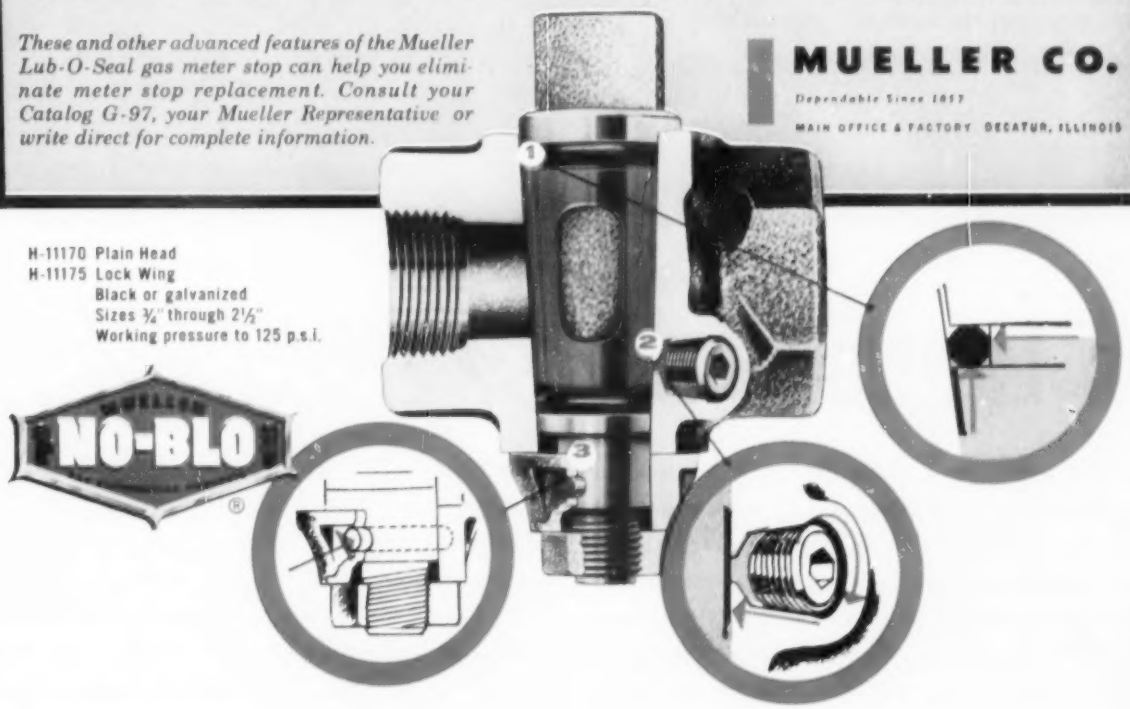
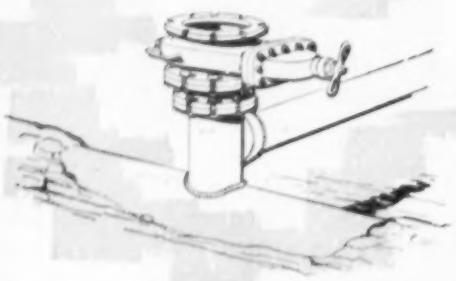
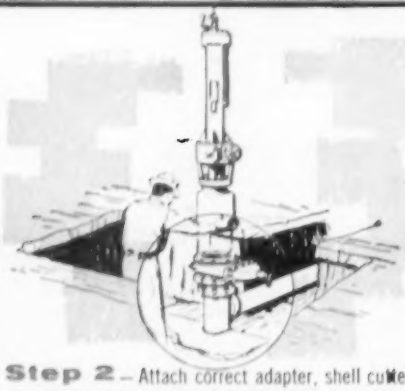
Working pressure to 125 p.s.i.

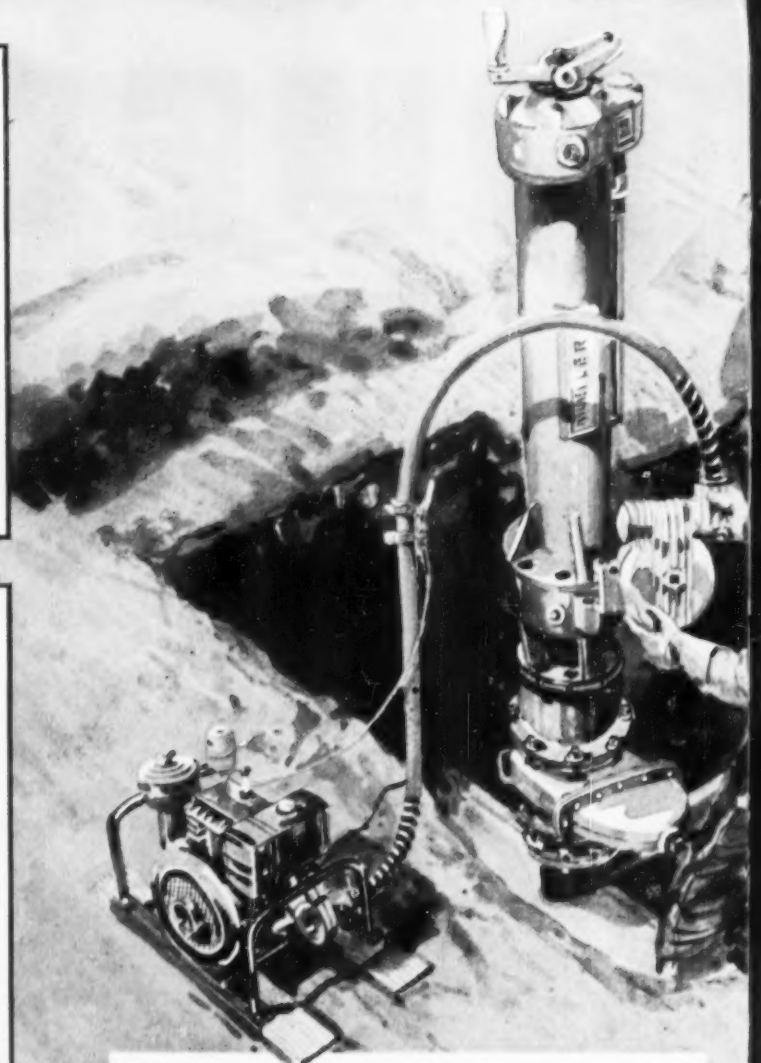




Step 1—Attach fitting to main. Complete lateral to first valve. Test. Bolt adapter and gate valve to flange of fitting.



Step 2—Attach correct adapter, shell cutter and pilot drill to Mueller C1-36 Drilling Machine. Coat shell cutter with Mueller Cutting Grease, retract boring bar. Attach drilling machine to gate valve. Open gate valve.



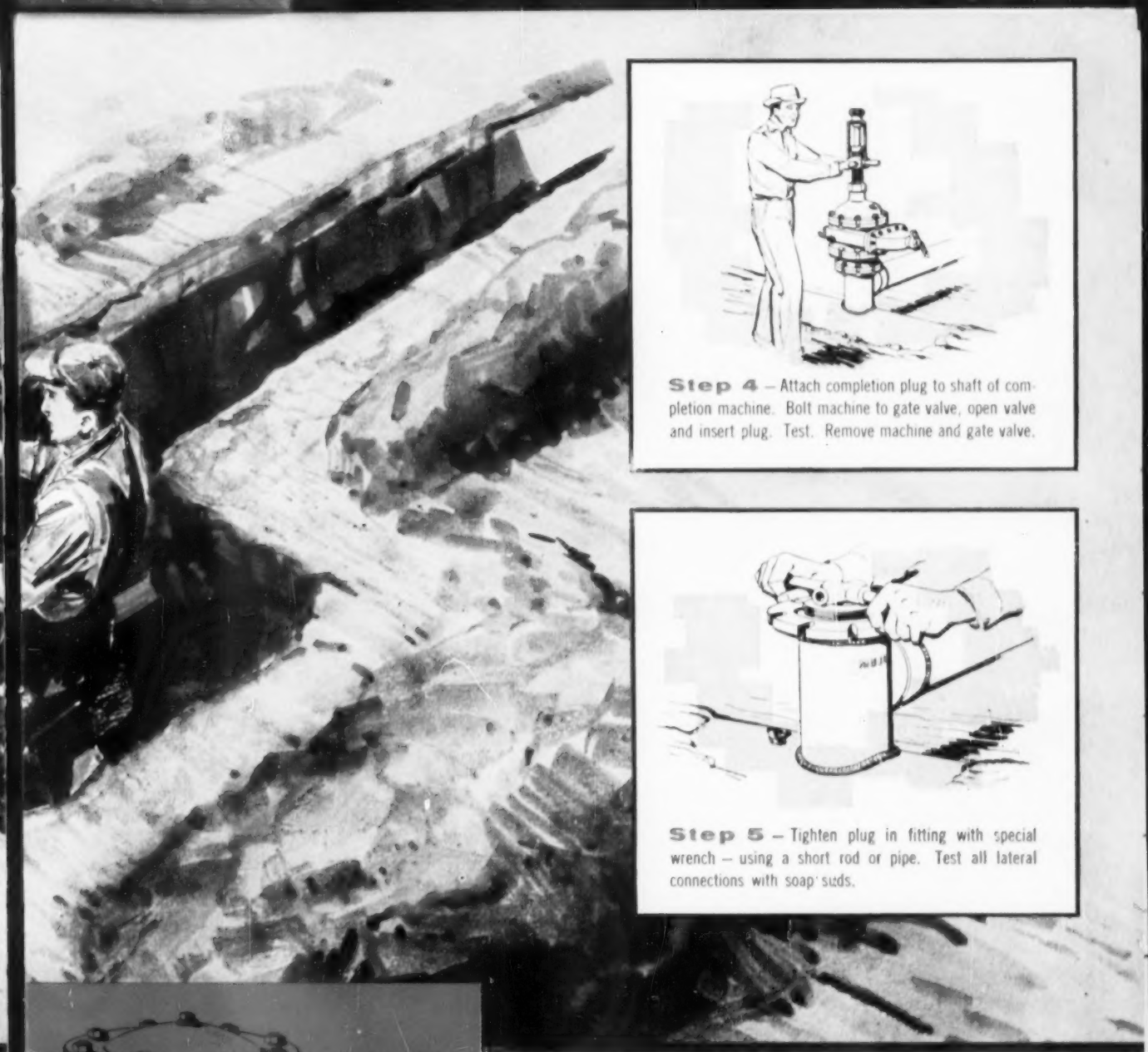
Step 3—Advance boring bar until pilot drill strikes main. Set feed indicator at zero and engage automatic feed. Make cut, retract boring bar, close gate valve and remove drilling machine. Power source for C1-36 Drilling Machine may be H-600 Air Motor or H-602 Gasoline engine drive unit.

Run Laterals *under pressure!*

Three different types of fittings may be used to run a lateral from steel mains. Temporary laterals may be run with the Mueller Save-A-Valve Drilling Nipple, which permits retrieving the gate valve when the line is abandoned. Permanent laterals may be run with the Flanged Tee or Extension Stopper Fitting. No gate valve is required and lateral stop-off is made with Mueller Line Stopping Equipment.

Laterals from a cast iron main may be run with a tapping sleeve or tapping cross and gate valve or extension stopper fitting. Fittings are equipped with mechanical joint to give safe, positive seal.

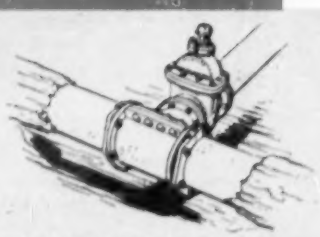
Regardless of fitting used, the installation procedure is similar once the fitting has been attached to the main. The entire operation is done under pressure, with no blowing of gas.



Step 4 – Attach completion plug to shaft of completion machine. Bolt machine to gate valve, open valve and insert plug. Test. Remove machine and gate valve.

Step 5 – Tighten plug in fitting with special wrench – using a short rod or pipe. Test all lateral connections with soap suds.

Step 6 – Place gasket on flange and bolt completion cap solidly in place. Laferal connection is now complete.



TAPPING SLEEVE AND VALVE INSTALLATION ON CAST IRON MAIN

MUELLER NO-BLO Method

Write for the new No Blo® Method Booklet, "Safe Operating Practice." It shows how other gas installations are made in a safe manner, without escape of gas.

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MAIN OFFICE & FACTORY DECATUR, ILLINOIS

GAS Thermally Thinking

Are today's engineers educated?

EDITOR Fred Ebdon tripped off to San Francisco not so long ago to represent GAS at the gigantic and sometimes confusing annual meeting of the American Petroleum Institute. Fred came back with some of the same observations that other reporters have already made, touching such matters as the exaggerated appearance of opulence and the drawbacks of having to cover a huge convention that is scattered from (almost) one bridge to the other. But what impressed him more was the concern being voiced over the manpower situation in scientific and engineering fields.

In his report on the meeting, Editor Ebdon said, in part:

"A grave concern of the petroleum industry that gas industry managements should seriously consider, is the shortage of engineers and scientists. At the API, it was brought out that the only obstacle to solving the nation's educational problem is the lack of determined leadership. The gas industry has increased its technology to the point where its operations, laboratories, research facilities, processing plants require many engineers and advanced scientists. There are probably enough eager young people fresh out of colleges with their credentials and slide rules to go around in the gas industry, but are they educated? Do they know anything that your gas company can use? Do they have business sense? Can you afford to turn pipelines, research labs, or an extraction plant over to them? Do they have any social awareness from an insight into humanities?

"Most of the gas industry leaders we talked to at the API in San Francisco said no. They even indicated that our statement about there being enough to physically meet the requirements on a numerical basis alone might require revision if a detailed study was made. Has the AGA or other gas industry organizations ever investigated the technical manpower requirements of the gas industry in relation to its demand?

"The oil industry was urged to continue and increase their participation in projects to make sure that teachers are available to our institutions of learning and the high schools do not slight preliminary studies leading to careers in science in favor of less important courses. The gas industry would do well to join and enhance this movement."

The message in Mr. Ebdon's remarks is a rather logical extension of the one carried in this column last month. It appears the gas industry, along with other industries of a more or less technical nature, is gobbling up scientific talent at an ever-increasing rate. Perhaps all these industries have an obligation to fulfill to education. And in fulfilling that obligation, they will be narrowing any gaps that might exist between the two fields. A more generous approach to the problem of building a firm scholastic base under tomorrow's engineers will certainly have its rewards in increased cooperation.

WILLIAM W. CLARK
Editorial Director

Jenkins Publications Inc.
198 S. Alvarado St., Los Angeles 57
Tel. DUnkirk 7-4337

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• Advertising Offices

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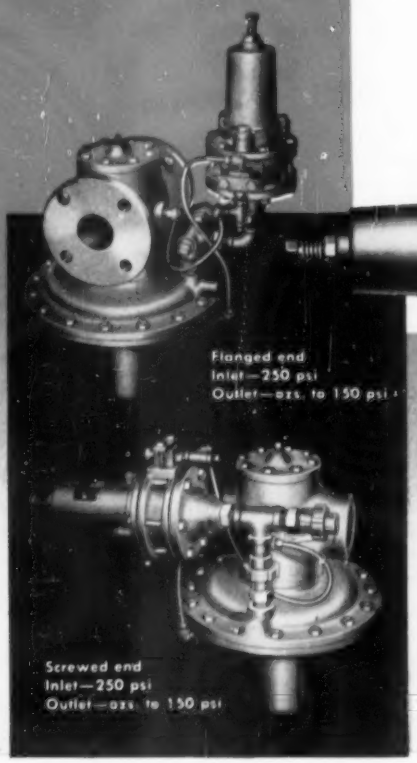
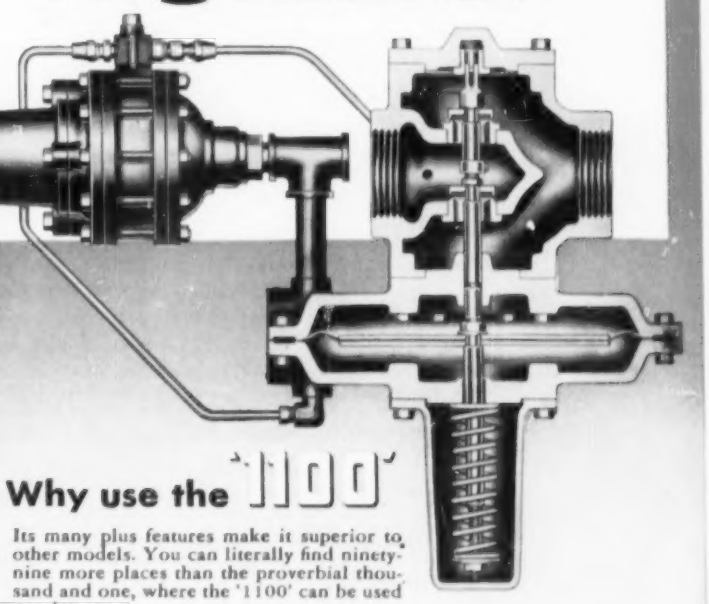
Chaplin-Fulton

why? '1100' regulator





Why use the '1100'

Its many plus features make it superior to other models. You can literally find ninety-nine more places than the proverbial thousand and one, where the '1100' can be used to advantage.

One basic assembly-2"-screwed or flanged.

- **WIDER APPLICATION**—inches water to 150 psi controlled pressure—means less different types to stock and service.
- **GREATER CAPACITY**—balanced valve construction passes 114,000 CFH at 100 psi to ounces—replaces larger costlier regulators to reduce cost of whole installation.
- **PROVEN PERFORMANCE**—straight line control from minimum to maximum flow. Stable operation on quick changing loads, or with on-and-off controls. Fast low lock-up on zero flow.
- **SIMPLER CONSTRUCTION**—no intricate parts or delicate adjustments. All wearing parts easily replaced. Regulator or pilot can be serviced without disturbing the other.
- **EASIER INSTALLATION**—compact design requires little space for installation in any position. Just place in line and make one connection from regulator to outlet line.

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Pittsburgh 25, Pennsylvania

Bulletin 1100 with complete information sent on request.

54-1100

highlights

GAS SPOT NEWS, TRENDS, COMMENT ON GAS INDUSTRY AFFAIRS

Whew! The records for 1955 were better than ever!

At year's end, the nation's gas utilities were serving 29.2 million customers, a gain of more than a million over the 1954 roll call. But that isn't all—

- Utilities and pipeline companies spent $1385 million for construction.
- Gross assets grew to nearly $16 billion.
- The gain in natural gas customers totaled nearly 2 million.
- Total gas sales hit 66.5 billion therms.
- FPC authorized 4500 miles of new line, and an additional 22,000 miles of distribution and storage line, not requiring FPC okay, was laid.
- Total line in the ground now totals 445,000 miles.
- Automatic gas water heater shipments hit 2,799,000 units, up 22.7% from 1954 to the highest peak in history.
- Shipments of warm air furnaces totaled 850,000, 30% better than 1954.
- Ranges shipped reached 2,277,000, 12% up from 1954.

LPG sales took their greatest jump in history

Fabulous as have been past sales gains in that fast-growing business, those recorded in 1955 were the biggest ever. The jump of 880,467,000 was a 17.2% increase over 1954. Totals for the year hit 6006 million gallons. Just a year before, sales had passed the 5 billion mark for the first time. Househeating and motor fuel uses scored the most impressive gains, along with chemical manufacturing in the non-retail field. In the "domestic and motor fuel" capacity, sales were up 15.3% to 3,661,000,000 gallons. Off-peak sales showed decided increases to help balance the sizeable gains in househeating. The only category that suffered was gas manufacture, where a downtrend started in 1951 continued with a 10.9% decrease. Natural gas was to blame, according to Phillips Petroleum Co., which annually compiles the year-end statistical review of the LPG industry.

Air conditioning sales expected to hit $3.2 billion in 1956

Cloud Wampler, chairman of Carrier, foresees a growth of 200,000 in domestic central air conditioning installations alone. Retail value of sales in this one category would thus total nearly $⅓ billion. By 1960, ½ million homes will be air conditioned each year, and by 1965 the number of new installations will have grown to 1,150,000, he thinks.

Dryer sales hit 1¼ million; 4% gain seen

The American Home Laundry Manufacturers Association conservatively predicts a 4% increase in dryer sales in 1956 over the 1¼ million sold in 1955. However, a steady gain through the next five years to a point where 1960 sales total more than half again as much as 1955's is confidently expected. Total sales in the later year would thus reach 1,938,000. Electric dryer sales, meanwhile, continue to outstrip gas: in 1955, the comparative figures were 912,000 against 330,000. By 1960, says AHLMA, electric will be selling at a rate of 1.5 million, a gain of 65%, while gas dryer sales will increase only 45%, to 480,000. *And nobody thinks 1956 will be anything but better—at least during the first half.*

Practically all industries see a better year in 1956

A last-minute survey by the Commerce Department among 25 industries reveals a strong current of optimism. Iron and steel expect the first half to be at least one of the best, if not the best, in history. New facilities will not completely overcome the tight supply situation. Aluminum shipments are expected to reach a new high. Even production of automobiles and trucks is expected to continue at record levels. New construction will go up another 5%, it is estimated. Consumer durables will "equal or slightly exceed the 1955 rate."

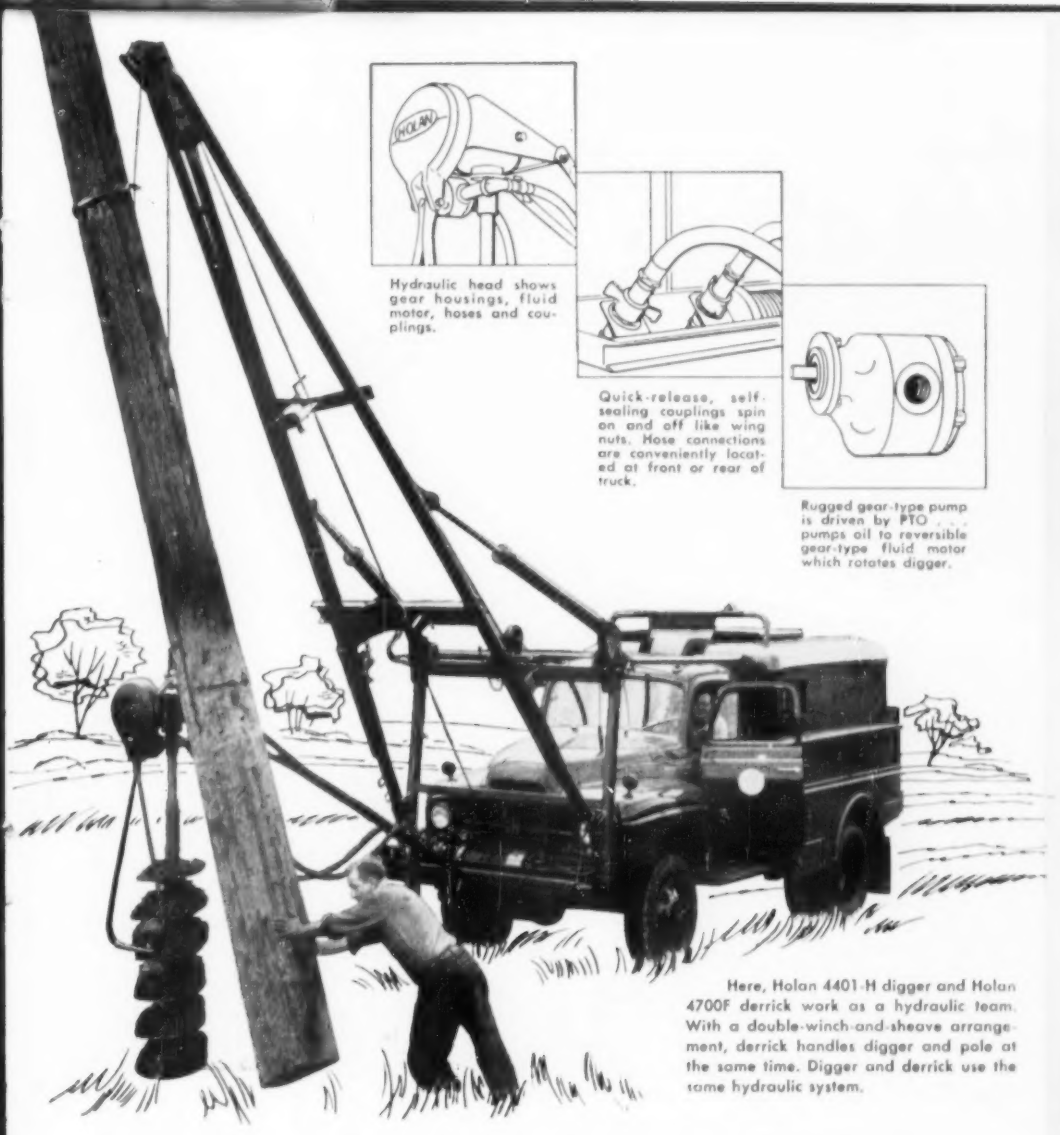
AGA joins Colgate-Palmolive Co. in $100,000 contest

To promote home laundry equipment and the new detergent "Ad," the association and the soap manufacturer will sponsor a nationwide jingle contest during February and March. Prizes will include 100 complete "New Freedom Gas Laundries," including gas washer-dryer, two-temperature gas water heater, and color-coordinated sink and cabinets.

Hydraulic head shows gear housings, fluid motor, hoses and couplings.

Quick-release, self-sealing couplings spin on and off like wing nuts. Hose connections are conveniently located at front or rear of truck.

Rugged gear-type pump is driven by PTO . . . pumps oil to reversible gear-type fluid motor which rotates digger.

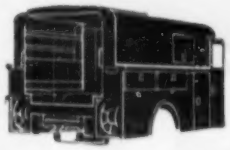


Here, Holan 4401-H digger and Holan 4700F derrick work as a hydraulic team. With a double-winch-and-sheave arrangement, derrick handles digger and pole at the same time. Digger and derrick use the same hydraulic system.

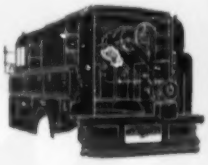
HYDRAULIC POWER MAKES BORING JOBS PLEASANT

Holan's new hydraulic digger is smooth going down. In fact, the 4401-H digs holes so easily that you appreciate most what it doesn't do. It doesn't vibrate and tire the workmen. It doesn't create mechanical stresses when stalled. And it doesn't require a lot of maintenance — there are no bearings, no universal joint, no shear pin, no complicated mechanical linkages. Putting it positively, the 4401-H makes hole-digging anywhere easier than ever before.

The Holan 4401-H Hydraulic Earth Borer digs holes from 8 to 20 inches in diameter and up to eight feet deep. Write for the new catalog.



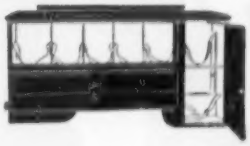
Air compressor bodies with hose reels in rear compartments.



Air compressor bodies with left handed compartments and air winch for backfilling.

Air compressor bodies with pipe compartment and provisions for oxygen and acetylene tanks.

Air compressor with skid-mounting and independent gasoline engine.



General service bodies with special gas meter compartments.

Service bodies for chassis up to 1½ tons. Lengths 72", 75", 84", 90" and 102". Optional compartment arrangements.

J.H. HOLAN CORPORATION

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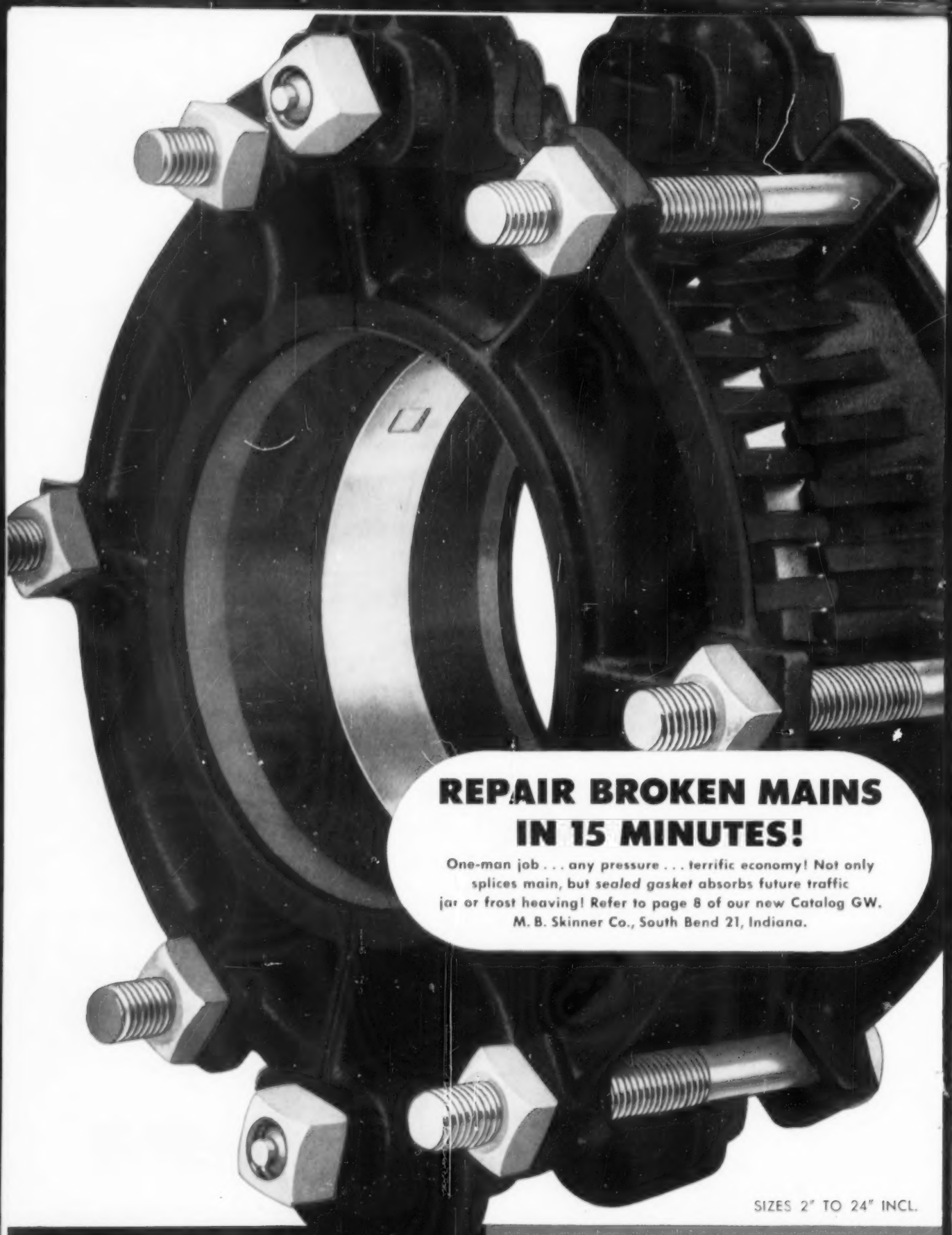

REPAIR BROKEN MAINS IN 15 MINUTES!

One-man job . . . any pressure . . . terrific economy! Not only splices main, but *sealed gasket* absorbs future traffic jar or frost heaving! Refer to page 8 of our new Catalog GW. M. B. Skinner Co., South Bend 21, Indiana.

SIZES 2" TO 24" INCL.

SKINNER-SEAL SPLIT COUPLING CLAMP

*regulatory and legislative trends

Independent gas producers are losing their independence

WITH each new decision by the Federal Power Commission, the 5000 independent natural gas producers realize more and more that they are losing their independence. They cannot terminate their sales in the field to interstate pipeline companies to take advantage of better business opportunities, or increase the sales price without authorization of FPC. The independence contemplated in private contracts by producers is vanishing because regulatory power under the Natural Gas Act is paramount to the terms of private agreements. The only hope for gas producers to regain independence is by corrective legislation.

A recent decision by the Federal Power Commission, with the aid of a United State District Court, prevented the abandonment of field sales by an independent producer of natural gas from eleven wells in Texas to an interstate pipeline company. The producer attempted to exercise termination rights under the contract. FPC obtained a court injunction against the producer pending the hearing on abandonment of service, and then ruled that public convenience and necessity would not permit discontinuance of such natural gas sales in the Texas dry gas field.

The independent gas producer in the West Panhandle field in Texas was engaged in the sale of natural gas to the Northern Natural Gas Co. under a contract made in 1936. The term of the contract was for the life of the leaseholds, and as long as gas is produced in paying quantities. This dry gas came from 11 wells with the remaining life of the gas reserves estimated at 10 years. The producer gathered the gas in a pipeline system composed of about eight miles of pipeline ranging from 4 to 10 in. in diameter. All the gas gathered by the producer in this pipeline system was delivered into an 8-in. pipeline of Northern Natural Gas Co. in the field. The gas then went through two compressor stations to enter the main 24-in. diameter pipeline of Northern which extends from Texas through Oklahoma, Kansas, Nebraska, Iowa, South Dakota, and Minnesota. The natural gas flows through the facilities of the producer into the pipeline system of Northern under the pressure which is contained in the wells. This gas was co-mingled with gas from Northern's gathering system before it entered the first compressor station. The gas was then co-mingled with gas purchased by Northern from other independent producers in the same field before it entered the second compressor station. Northern's interstate pipeline system transports gas to be sold directly to customers and for resale in over 300 communities in five states.

The Federal Power Commission found that there is a continuous and uninterrupted flow of natural gas from the independent producer's wells in Texas through its pipelines and other facilities, then through Northern's pipeline system to markets in other states. The producer knows that the natural gas delivered by it to Northern from its 11 connected wells is destined for transportation to other states. The Federal Power Commission concluded that it had jurisdiction over this small independent producer because the sale to Northern Natural Gas Co. is a sale in interstate commerce for resale for ultimate public consumption.

During the hearing before the Federal Power Commission, the producer notified the commission and Northern Natural Gas Co. that it intended to discontinue its sale of gas to Northern. The commission then obtained an injunction from a United States District Court to prohibit the cessation of gas deliveries. The federal court found that the interstate journey of the gas begins when the gas leaves the independent producer's gathering lines, if not before, and any argument that the interstate journey commences only after the gas is placed under the compression necessary to transport it interstate is not valid.

The district court quoted the United States Supreme Court thus: "The increase of pressure in the compressor stations must be regarded as merely an incident in the interstate commerce rather than as its origin." The Federal Court found that the sale by the producer was made at a point where production and gathering have ceased by that producer. The federal district court quoted the Interstate Natural Gas Co. decision of the United States Supreme Court as follows: "By the time the sales are consummated, nothing further in the gathering remains to be done. We have held that these sales are in interstate commerce. It cannot be doubted that their regulation is predominantly a matter of national, as contrasted to local, concern. All the gas sold in these transactions is destined for consumption in states other than (the state of production). Unreasonable charges exacted at this stage of the interstate movement become perpetuated in large part in fixed items of costs which must be covered by rates charged subsequent purchasers of the gas including the ultimate consumer. It was to avoid such situations that the Natural Gas Act was passed."

The United States district court rejected the producer's argument that its sale in Texas to Northern Natural Gas Company was exempt from federal regulation because it was a part of production and gathering. The Federal Court quoted the United States Supreme Court's decision in the famous Phillips Petroleum Co. case thus: "We believe that the legislative history indicates a congressional intent to give the commission jurisdiction over the rates of all wholesalers of natural gas in interstate commerce, whether by a pipeline company or not and whether oc-

*A monthly commentary on national and state developments by an expert in the field of utility law.

Regulatory trends ... FPC says producers must meet statutory requirements before abandoning service

curring before, during, or after transmission by an interstate pipeline company."

The federal district court interpreted the Natural Gas Act to apply to the sales made by this independent producer in Texas to Northern Natural Gas Co. The court also commented on the constant refusal of Congress to amend the Natural Gas Act to exclude such independent producers from FPC jurisdiction.

The Texas gas producer contended that the Federal Power Commission did not have power to issue a certificate of public convenience and necessity for the facilities used to deliver gas to Northern because the producer is unwilling to continue to render such service. The Federal Power Commission dismissed this contention by stating that unwillingness applies in the case of an application for a certificate relating to new operations. The commission stated, "The operations in question are operations which have persisted over a period of years, when the application for a certificate authorizing the service is finally filed to avoid continued violation of the act, and further when there is filed concurrently an application for abandonment of the same service, unwillingness, which is a self-serving position, cannot be given controlling or any effect".

The independent producer claimed that the Federal Power Commission had no authority to prevent the abandonment of the gas sale in the Texas field to Northern for the reason that the sale is not made by means of any facilities subject to the jurisdiction of the commission. The producer asserted that it had no facilities for making deliveries which are not also production or gathering facilities exempted by the Natural Gas Act. The FPC found the producer's claim to be erroneous and pointed to facilities owned by the producer used for the sale of gas to Northern which have no production or gathering function. The commission asserted, "It is physically impossible to make a sale and delivery of natural gas without having facilities therefore." Then the FPC described the facilities supplied by the independent producer for the sale as being "(1) The stub-pipe connection between its 10-in. northerly-southerly gathering line and Northern's 8-in. pipeline, at the point adjacent to Northern's meter run; and (2) the system of block valves. The function of the stub-pipe connection is that of moving the gas into Northern's facilities, and thereby effecting its sale and delivery. The three block valves also serve an important function in the making of the sale. By means of the valves, Huber has absolute control of the volume of gas which moves to Northern."

The FPC concluded that the Texas producer has facilities used for its sale of natural gas to Northern which are not production or gathering facilities, and that the producer renders a service to Northern by means of facilities subject to the commission's jurisdiction. The commission added that the producer cannot abandon gas service without obtaining the consent of the commission.

The producer claimed that the pipeline of Northern Natural Gas Co., into which it delivered gas in Texas, had not been certified under the Natural Gas Act. The producer added that the commission should not require him to sell gas to Northern, because it would be contributing to the continuation of an unlawful act by Northern through operating a pipeline without a certificate. The FPC declared that, "Assuming that the operation of Northern's 8-in. pipeline has not been authorized, any unlawful operation by Northern cannot justify unlawful operation or acts by Huber. Northern's want of a permit can be no legitimate ground for the commission permitting Huber to abandon its sale to Northern."

The producer contended that it had a contract right to terminate its agreement with Northern and therefore was entitled to abandon the service. The FPC found that the producer misconstrued the contract. The contract provided (1) that the seller may add to the purchase price of the gas any production tax imposed by Texas, and (2) that if a governmental regulatory body established a purchase price lower than the contract price, the seller had the right to cancel the contract. In 1954, the Texas production tax was increased. The producer claimed that FPC Order No. 174A prevented it from receiving the amount of the increase and then served a notice of cancellation of the contract. The FPC stated that Order No. 174A does not prevent Northern from paying the higher price to the producer reflecting the tax increase, but that it was necessary for the producer to file a change in rates under FPC procedure. The commission noted that the producer had not filed a change of rate, but that Northern is ready to pay the amount of the tax increase when the rate is filed with the FPC and becomes effective. The FPC said that it had not prescribed a purchase price less than the contract price and that the producer's failure to comply with FPC regulations is responsible for its not having been reimbursed for the increased tax. The commission added that in any event the independent producer must still meet the statutory requirements before it could abandon gas service.

The producer then claimed that public convenience and necessity permit the proposed abandonment. The producer is engaged in the manufacture of carbon black and claimed that it needed the gas supply which it sells to Northern for carbon black production. The producer claimed carbon black put in materials for the armed forces made that gas use superior to its current industrial use. The commission reasoned that, "The volume of Huber gas is substantial and constitutes an integral part of Northern's total supply. Huber's demands are purely individualistic and are for personal profit. In the past, the commission has relied upon the Huber reserves, among other reserves, in authorizing Northern to increase the capacity of its system. Also, if the gas supply from the Huber wells were not available to Northern, the continued operation of Burnett compressor station would be economically unfeasible. This compressor station has three units, installed in 1948, 1949, and 1953 at a cost of $225,000."

The commission denied permission to this independent gas producer to abandon its sales of gas to the interstate pipeline company after finding that (1) the available supply of the producer's natural gas is not depleted to the extent that the continuance of the sale to Northern is unwarranted, and (2) neither the present nor future public convenience and necessity permits the abandonment by the producer of the facilities used to make the delivery to Northern or the sale of gas. ■

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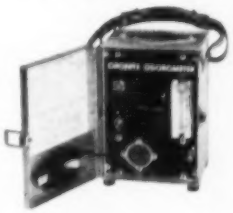

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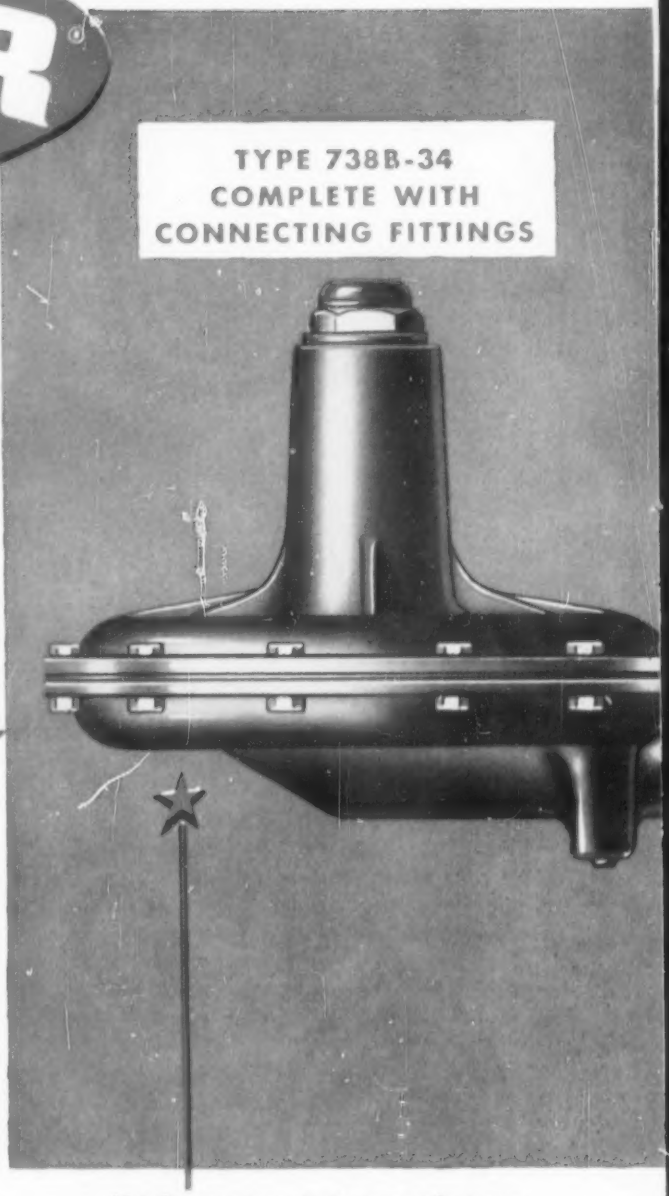

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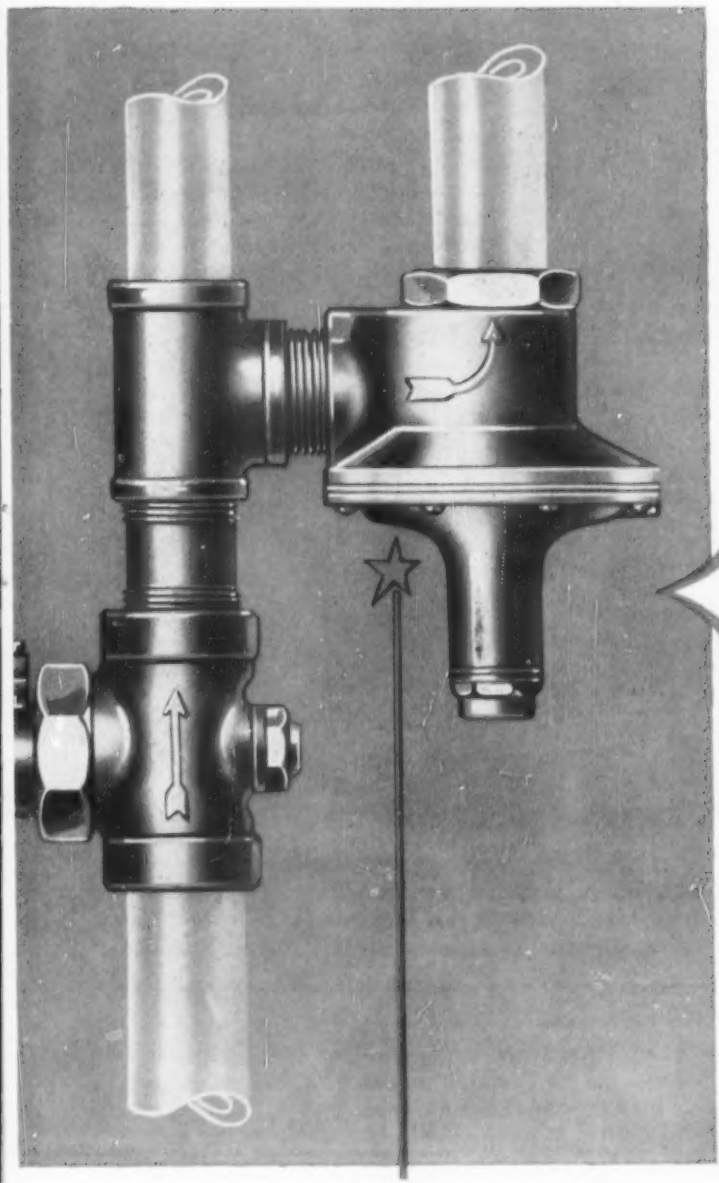

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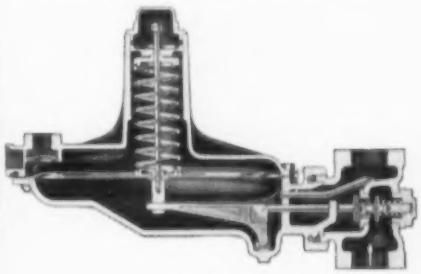

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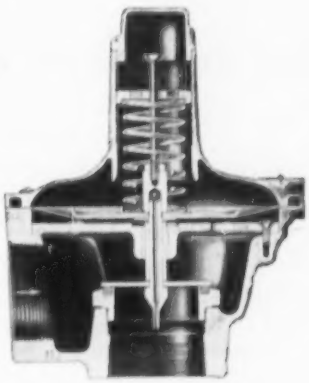

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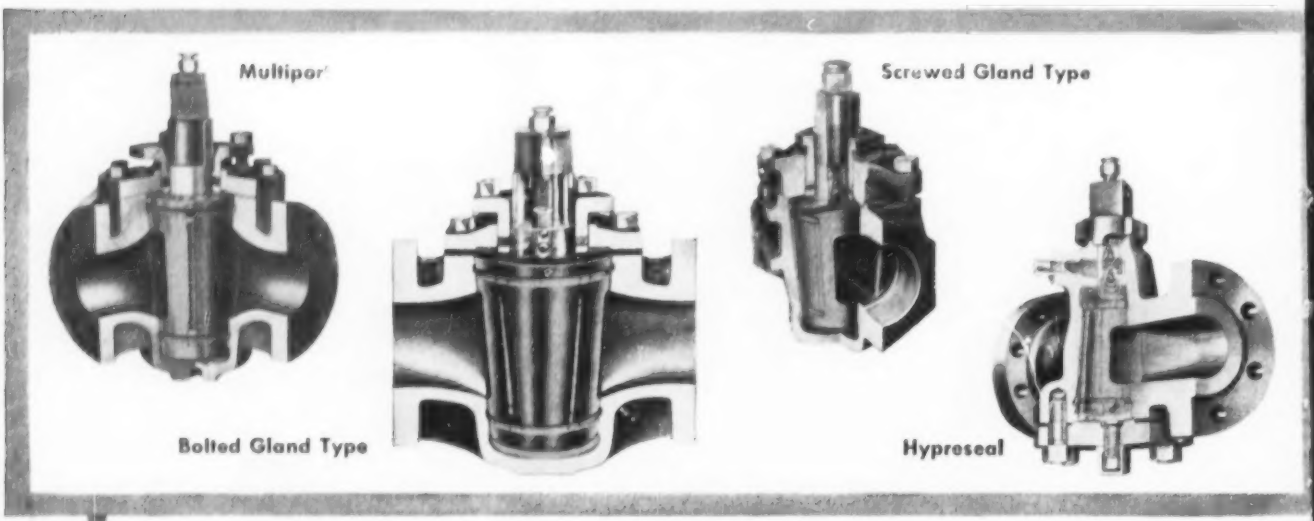

1.

"Sealdport" Surrounds Ports with Lubricant Pressure.* **"Sealdport"** grooves at both sides of the plug give complete shut-off in either direction. In the closed position, the ports are completely surrounded by a sealing lubricant film. When turning the plug, grooves exposed to the line fluid ports are automatically disconnected.

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2.

Positive, Quarter-Turn, Rotary Action. The tapered rotary principle is the simplest, most positive valve action known. The taper of the plug and seat maintains an intimate working contact between the two parts at all times. Quarter-turn operation is from two to five times faster than ordinary valves.

3.

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4.

Simplest of All Valve Designs. There are only three basic parts comprising the standard Rockwell-Nordstrom valve—(1) body, (2) cover, (3) plug . . . the only movable member. It is a mechanical axiom that "the fewer the parts, the fewer the repairs."

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5.

Full Floating Hypreseal Plug. The Hypreseal stem is entirely independent of the tapered valve plug except by a floating equalizer ring. The stem has a long threaded engagement in the neck of the valve body to carry the outward line pressure thrust and seals against leakage without excessive friction of deep stuffing boxes. The stem thread is lubricated and sealed by lubricant from the chamber surrounding the equalizer. Injection type packing prevents escape of lubricant around the stem.

6.

Resilient Plug Seating. In Rockwell-Nordstrom valves the plug has a small, but highly important, degree of resiliency. This prevents binding, allows the lubricant "jacking" action to function properly, and avoids unseating which would result in loss of lubricant, seat exposure or damage.

7.

Shoulder Seal. The shoulder type of stem seal is used in preference to conventional stuffing boxes. It is compact, produces a minimum of friction, and combines the functions of stem seal and thrust bearing.

8.

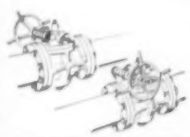
Smoothly Contoured Passages. The interior of Rockwell-Nordstrom valves presents an unbroken line devoid of crevices for any lodgment of line contents. Flow characteristics are designed for minimum pressure drop.

9.

Repackable under Pressure. The Rockwell-Nordstrom Hypreseal is the only valve that can be repacked under any line pressure and in any position. This eliminates shutdown of the line. No packing gland or stuffing box is used.

10.

Adjust or Lubricate under Pressure. Rockwell-Nordstrom valves are the only type of valve that can be fully adjusted and lubricated in service. In any operating position the plug can be jacked from its seat by a few turns of the lube screw or by injections with a lubricant gun.

11. 

Flow Either Way at Any Differential. Rockwell-Nordstrom valves are not restricted to one-way flow. There is no single "pressure side" requiring a specified end to go on the upstream side. Since the Rockwell-Nordstrom non-wedge action and transfer of plug pressure to the lubricated seat allows *operation at any pressure differential* within its range, galled or frozen valves and by-passes are eliminated.

12.

No Bonnet Cavity—Saves Weight and Space. Compare the overall dimensions of Rockwell-Nordstrom valves with any other type of valve and note the saving in space. For most Rockwell-Nordstrom valves the space occupied is little more than the diameter of the line pipe flanges.

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Frederick Gas Company, Inc.
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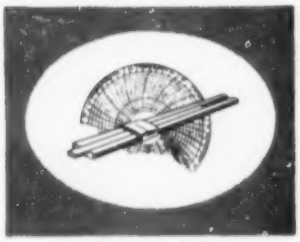
technical trends



• By GUY CORFIELD

Synthetic "natural" rubber

A new rubber process developed by Firestone has resulted in a synthetic material so similar to natural rubber that it has been called "tree" rubber. It is made from isoprene by polymerization in the presence of an ionic (alkali metal) type catalyst. The polymer has high gum tensile strength and good retention of properties at high temperatures (properties lacking in the familiar GR-S and other war and early post war synthetics).

This new rubber is compatable with natural and GR-S rubber in all proportions, and is similar in vulcanizing characteristics, reception of reinforcing agents, and resistance to solvents and chemicals. It is superior to natural rubber in cracking resistance and thermal stability, and at temperatures in the vicinity of 250° F has 2 to 4 times the strength of GR-S. Its heat build-up is about half that of GR-S and about the same as that of natural rubber.

The largest use of this new rubber is seen for truck tires, because of its resistance to high heat build-up when running with heavy load for long distances. Road tests indicate about 95% of the wear resistance of natural rubber, and Firestone thinks additional developments will improve this. Its cost will be somewhat higher than GR-S but about the same as the present price of natural rubber.

Raw feed for synthetic ammonia plants

Large quantities of synthetic ammonia are now being produced and used for industrial purposes and increasingly as fertilizer. This ammonia is synthesized from hydrogen, a considerable portion of which has been produced from natural gas by the partial oxidation process. This process forms carbon monoxide and hydrogen (the classical "synthesis gas"), which is further converted by the "shift reaction" to additional hydrogen, and carbon dioxide, and the carbon dioxide then removed by scrubbing with amine solution.

As a result of research that has been going on for the past 10 years, this same general process can now be used to produce hydrogen from any gaseous or liquid hydrocarbon. This development is now influencing the planning of new ammonia plants, stimulated by the possibility of using cheap residual oils in the future when it appears that natural gas prices will increase. Inasmuch as, in the present stage of development, natural gas is still the most convenient feed, some plants are being designed to use interruptible natural gas when obtainable, with facilities to switch to whatever liquid fuel is available at the most economical cost. Others are planning to use liquids entirely, from diesel oil through to heavy residuum. It is even claimed that the process can be adapted to use of coal, and vizualized that ultimately the almost limitless deposits of oil shale and tar sand could be utilized.

While this development does not appear to be of serious significance to the natural gas industry, because the total quantity of natural gas used for ammonia synthesis is relatively small, it is of considerable general interest as indicating the creative research that is tirelessly and continuously extending and improving the economic use of our natural resources.

Rubber gaskets

Gaskets made of various formulations of rubber find considerable use in the gas industry in compression couplings, leak clamps, etc., under rather exacting conditions wherein they must be flexible enough to permit installation and to accommodate themselves to the space they occupy, but at the same time exert the resistance to compression between the sealing surfaces that makes for permanent gas tightness of the joint which they form. If and when there is a decrease in the force with which the gasket pushes against its confining surfaces, the gasket is said to be exhibiting "stress relaxation," and obviously the material with the least stress relaxing tendencies (other properties being equal) is the most satisfactory.

Committee D-11 of the American Society for Testing Materials has been studying this property for some time, and an interesting article entitled "Stress Relaxation of Vulcanized Rubber in Compression and Tension" will be found in the ASTM *Bulletin*, July 1955, page 78. A test method is described whereby gasket materials can be checked for their stress relaxation under selected loading and periods of time. A related article, "Stress Relaxation of Non-Metallic Gasket Materials" appears in the same issue on page 81, describing the Farnam-Cole Relaxometer, Type RT, Model D, which is stated to be "currently adequate for qualification testing of all varieties of non-metallic gasket materials . . . for . . . percentage stress relaxation."

Anyone interested in specifications for rubber gasket materials will find considerable information under ASTM Specification D-735, "Rubber and Synthetic Rubber Compounds for Automotive and Aeronautical Applications."

Fortunately, the rubber gasket materials used by the gas industry are, after installation, for the most part, underground or otherwise protected from the destructive effects of air and sunlight. This is not the case during storage and in transportation on work trucks, however, and if gaskets cannot be kept in sealed packages they should if possible be of a formulation resistant to deterioration from atmospheric exposure.

Another new development using

B. F. Goodrich Chemical *raw materials*

B. F. Goodrich Chemical Company does not manufacture this pipe. We supply only the Geon resin.

CHECK THESE 4-WAY SAVINGS WITH RIGID VINYL PIPE

Installation time cut • Heavy machinery eliminated • Two man crew does the job • No corrosion, longer life.

Here's a hot case history of how costs were cut four separate ways by specifying plastic pipe made from Geon high impact rigid vinyl resin. The installation collects crude oil in a water flood system near Tulsa, Oklahoma.

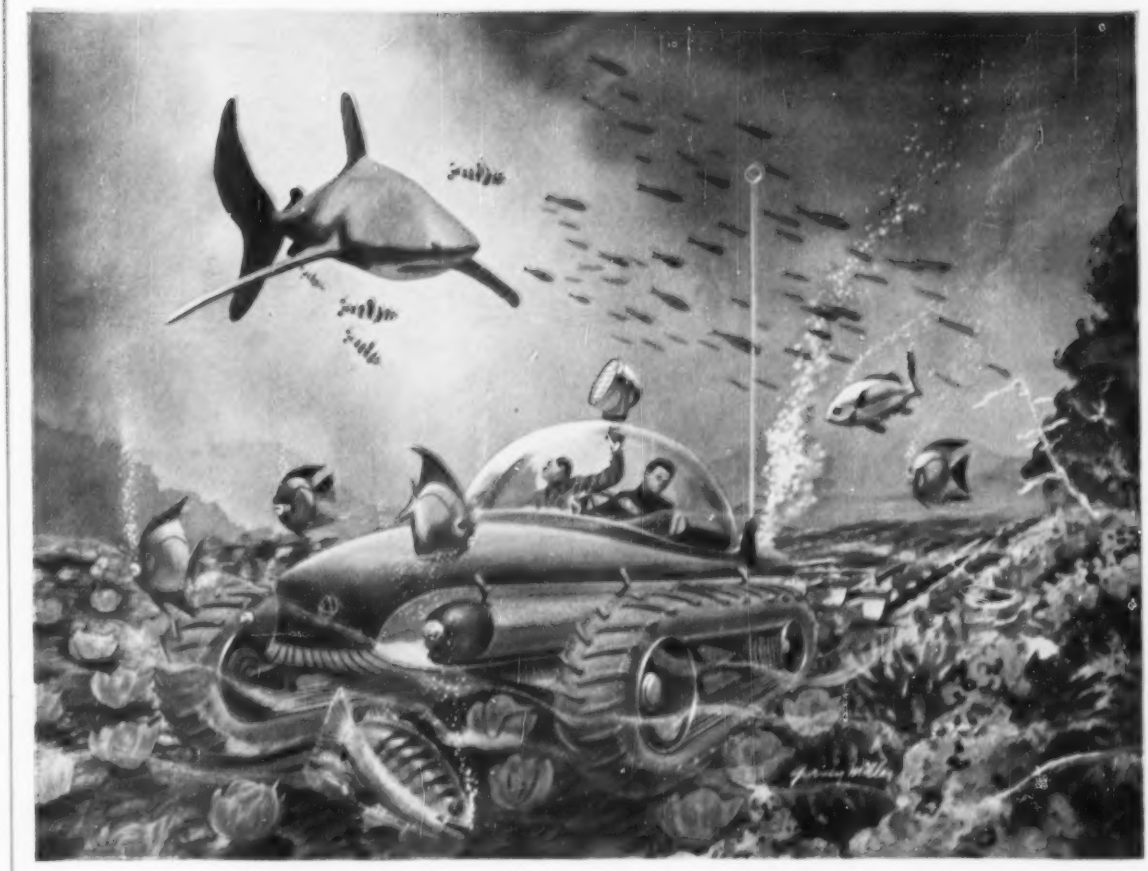
The plastic pipe replaces 2 miles of steel pipe that failed due to salt and sulphur corrosion. A two man crew laid 640 feet of 3 inch rigid vinyl pipe made from Geon resin in an hour. No heavy machinery was used; the pipe is so light a length can be handled by one man.

Biggest saving comes from the long life of rigid vinyl pipe made from Geon resin. It withstands rough handling, won't corrode, has better chemical resistance, and costs less than many other pipe materials.

Rigid plastic pipe is but one of many products made from Geon polyvinyl materials that show similar economies in both installation and upkeep. Sheets, valves and other products used in the petroleum and chemical industries demonstrate daily the versatile qualities of Geon polyvinyl materials. For information on Geon materials, please write Dept. DM-1, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

GEON RESINS • GOOD-RITE PLASTICIZERS . . . the ideal team to make products easier, better and more saleable.

GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors



Giant crops of microscopic algae . . . rich in vital food elements . . . grown under the sea to help feed a hungry world. Scientists say it will come.

100 years from now... WE'LL "FARM" THE SEA TO FEED A HUNGRY WORLD!

Hard to imagine. But in the fabulous world of tomorrow, there'll be one familiar note: water and gas will still be carried by the dependable, cast iron pipe laid today. Over sixty American cities still use cast iron water and gas mains a century and more old. And today, U. S. Pipe...centrifugally cast and quality-controlled from mines to blast furnaces to finished product...is even tougher, stronger, more durable.

U. S. Pipe is proud to be one of the leaders in a forward-looking industry whose service to the world is measured in centuries.

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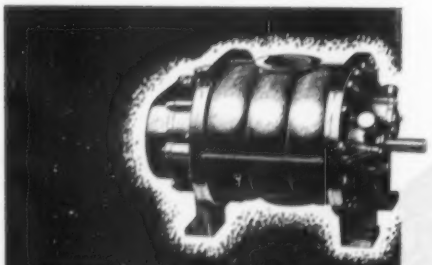
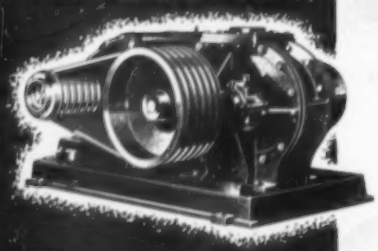
PIPE
FOR WATER, GAS, SEWERAGE AND INDUSTRIAL SERVICE
CAST IRON

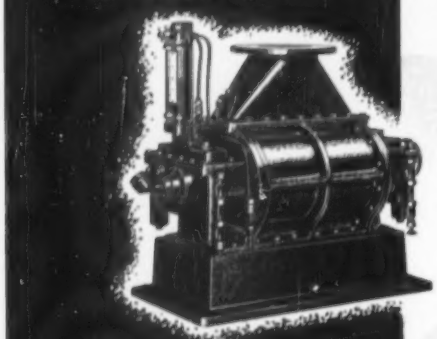
U. S. PIPE AND FOUNDRY CO., General Office: Birmingham, Alabama
A wholly integrated producer from mines and blast furnaces to finished pipe.



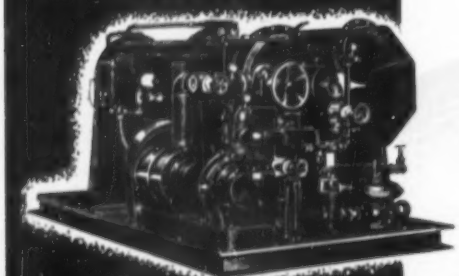
BLOWERS for such widely varying needs as lifting a damaged airplane or injecting air into water to provide oxygen for safe transportation of fish in tanks. Capacities as low as 5 cfm or up to 100,000 cfm or higher.



GAS PUMPS for inflating balloons, manufacturing electronic tubes or extracting gases from contaminated areas for test samples. They'll deliver as little as 5 cfm or as much as 50,000 cfm or more.



METERS help save money or make more profits by accurately measuring almost any kind of gas which you buy, sell or use in manufacturing processes. Cash register accuracy from 2,000 to a million cfh.



INERT GAS GENERATORS make hazardous operations safer from fire or explosion. They protect people, plants and products . . . and often return more than they cost in reduced insurance premiums. They'll produce inert gas for almost any use. You can have as much as 50,000 cfh or as little as 1,000 cfh in mobile or stationary equipment.

How to pull DOLLARS out of the AIR

New ways to put air (or gas) to useful, profitable work are constantly being developed by engineers and designers. These result in more effective machines and devices—frequently replacing slower or more expensive methods—often reducing the first cost of the equipment itself. These results are accomplished . . .

by resourceful engineering

In many of these applications, designers and engineers have utilized standard R-C equipment, sometimes with special adaptations. The problem may call for a small or large volume of air, moved by R-C Blowers or Exhausters. It may require vacuums, produced by R-C Vacuum Pumps. Perhaps metering or pumping of gas is needed, also met by R-C products. In any event, the solution is often . . .

aided by Roots-Connersville experience

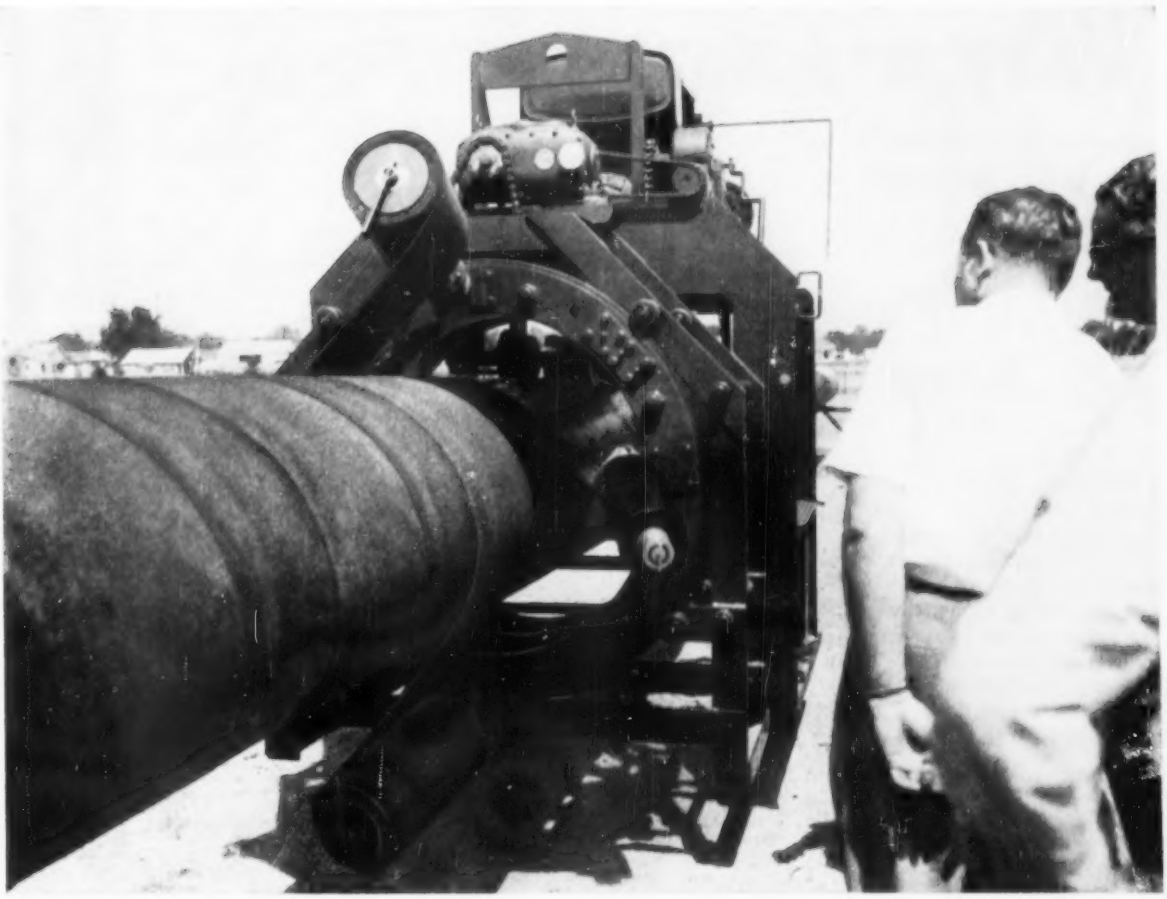
If you use or build for resale any product which might be improved by utilization of air at moderate pressures, by vacuums or by moving gas, perhaps we can help you. Even if you have only the ghost of an idea that might pull dollars out of the air, we'll gladly work with you.

Just address:

Product Development Manager, Roots-Connersville Blower Division, 156 Oregon Ave., Connersville, Indiana.

ROOTS-CONNERSVILLE BLOWER

ONE OF THE DRESSER INDUSTRIES



HOW MUCH CAN YOU SAVE

if you protect your pipeline with Polyken Protective Tape Coatings?

MORE—PROBABLY A LOT MORE THAN YOU THINK.

We wouldn't want you to assume that *Polyken* Protective Tape Coatings are priced lower than all other coatings. They aren't, and may sometimes even cost a little more applied than lower quality coatings.

But here are 6 reasons why we *can* promise a substantial saving:

1. *Polyken* controlled strength—careful control in the selection and processing of raw materials;
2. Uniform thickness and quality;
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5. High speed, low-labor power taping for "big inch" as well as "littlest inch" installations;
6. Lowest equipment investment and manpower costs possible.

Of course we can't figure your costs here in dollars and cents. But show us your plans—and we suspect you'll be surprised at how much you can save on dependable protection.

Let's talk it over now. See our complete catalog in Sweet's Industrial Construction File or write, wire, or phone *Polyken*, 222 W. Adams Street, Dept. (G-A), Chicago 6, Illinois, RAndolph 6-4250.

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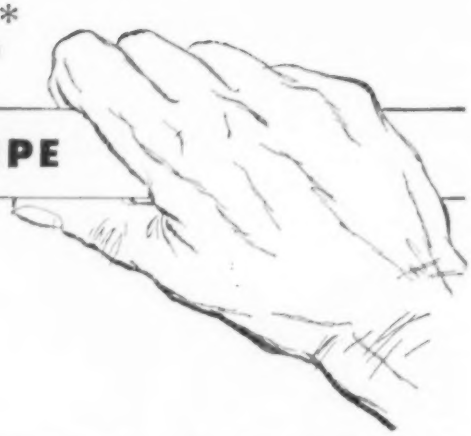
CONTROLLED STRENGTH

PROTECTIVE COATINGS

THE KENDALL CO., POLYKEN SALES DIVISION

Why USS NATIONAL*

POLYVINYL CHLORIDE PIPE



is the practical choice for natural gas lines

JUST as Stainless Steel is the absolute ultimate in metal pipe and tubing, so is Polyvinyl Chloride the unparalleled material for plastic pipe.

National Polyvinyl Chloride Plastic Pipe is not a "substitute" material—it's a high quality unplasticized-rigid pipe, specifically designed for applications where it will do a *better* job than any other material. It is ideal for dry and wet natural gas lines.

Two types of extruded National Polyvinyl Chloride Plastic Pipe are available in sizes ½" to 6" inclusive and in Schedules 40 and 80.

NORMAL-IMPACT—for installations requiring the highest chemical resistance attainable, together with high strength and excellent creep resistance.

HIGH-IMPACT—for installations requiring excellent chemical resistance and a high degree of toughness even at low temperatures.

The following properties are shared by both Normal- and High-Impact National Polyvinyl Chloride Plastic Pipe:

Chemical Resistance—resists attack by acids, alkalies, salt solutions, and alcohols, as well as many other types of chemicals. Nontoxic. Will not impart tastes or odors to liquids.

Rigidity—permits use in overhead piping installations with pipe supports. Schedule 80 pipe may be threaded with steel threading dies.

Light Weight—Twenty feet of 2-inch Schedule 40 pipe weighs less than 13 pounds. Easier to install in cramped quarters and hard-to-reach places.

Weather Resistance—resists deterioration due to aging when exposed to direct sunlight, plus resisting fungi, bacterial action and soils.

Ease of Installation—fittings readily attached by either (1) solvent cementing, (2) threading, (3) heat welding, (4) adhesives.

Smooth Internal Surface—results in low flow resistance, minimizes the build-up of deposits.

*Trademark

For the full story on USS National Polyvinyl Chloride Plastic Pipe, send for Bulletin 24. Write to National Tube Division, United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

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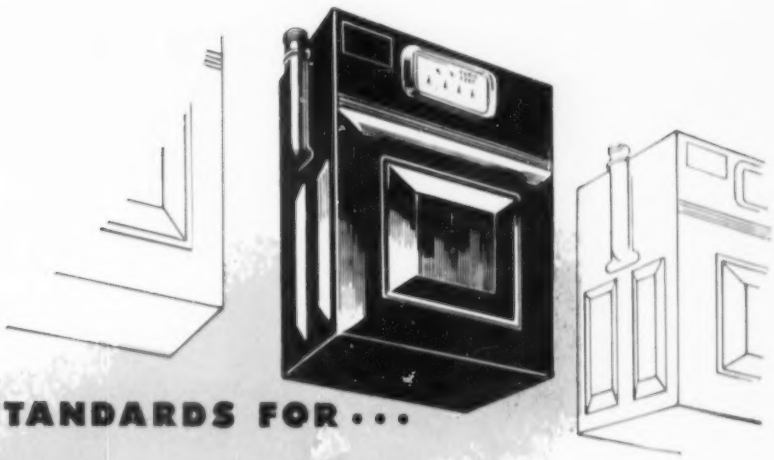
NATIONAL *plastic* PIPE

UNITED STATES STEEL



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Uniformity
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Lower Maintenance

Serving the leaders of the progressive gas industry since 1912 with a complete line of tinned-case gas meters, Superior Meter Company is now taking a giant step forward. Superior has joined Neptune Meter Company and Revere Corporation of America, becoming an active member of one of the world's major meter and instrument groups.

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To match these forward-looking developments, our staff has been enlarged by the appointment of highly respected meter design and quality control engineers. Our field service and warehousing are also being broadened.

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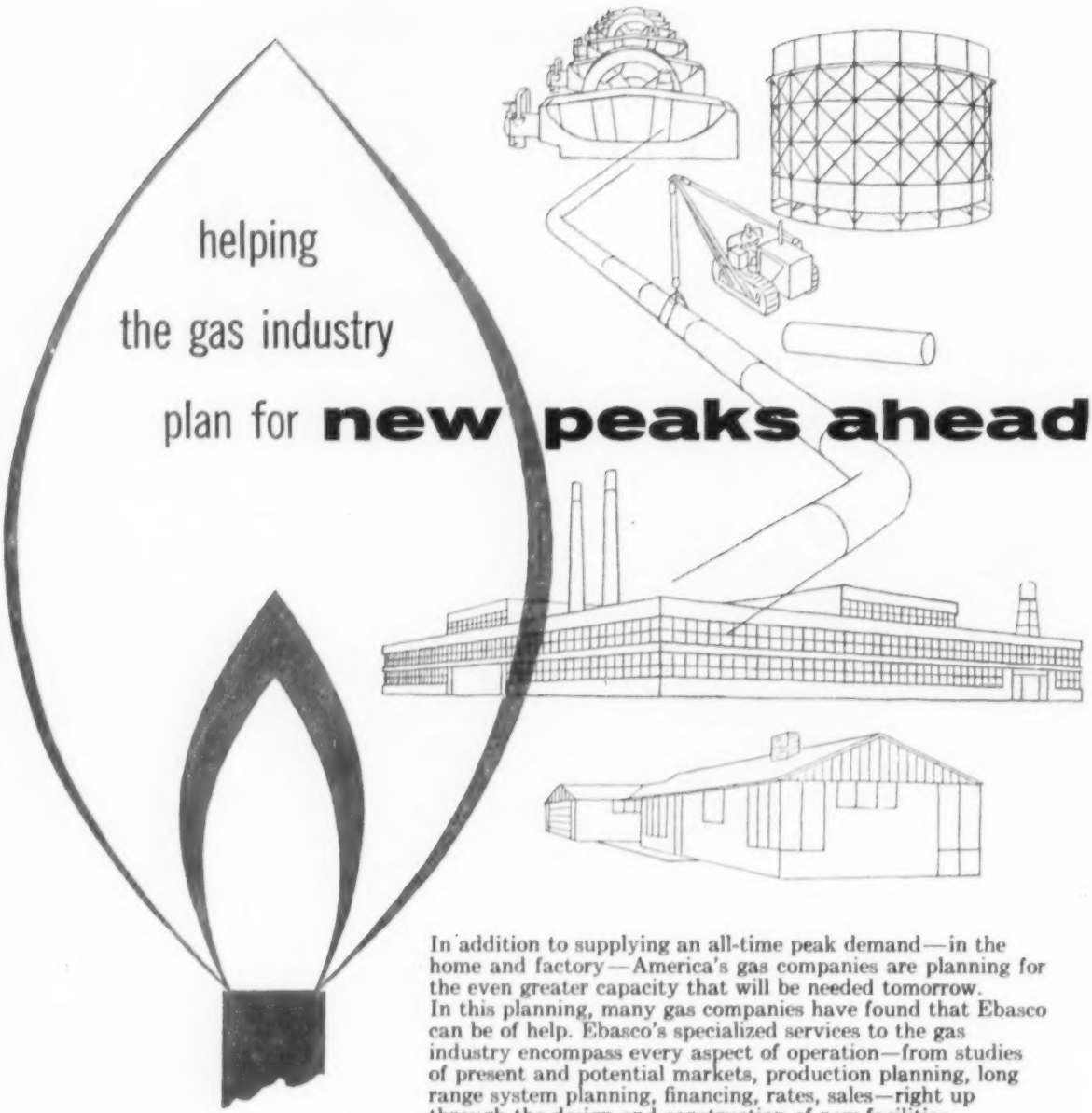
superior
GAS METERS

SU-1



helping
the gas industry
plan for **new peaks ahead**

In addition to supplying an all-time peak demand—in the home and factory—America's gas companies are planning for the even greater capacity that will be needed tomorrow. In this planning, many gas companies have found that Ebasco can be of help. Ebasco's specialized services to the gas industry encompass every aspect of operation—from studies of present and potential markets, production planning, long range system planning, financing, rates, sales—right up through the design and construction of new facilities.

In its half-century of service to the gas industry, Ebasco has worked for clients on every phase of operations. For more information about our services, ask for "The Inside Story of Outside Help." Write: Ebasco Services, Incorporated, Dept. F, Two Rector Street, New York 6, N. Y.

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The Remington Rand magnetic-core memory is more than a laboratory promise. It has been in actual customer use for over a year, passing all tests with flying colors in the first commercially available electronic computer to use core storage successfully.

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Univac's external memory—magnetic tape—now has greater capacity, too, increasing input and output to 20,000 characters per second . . . equivalent to reading or writing every character on this page over 1,000 times a minute.

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SERIES 25G & 35G Bodies are designed for meter installation and general service work. Weathertight compartments are equipped with shelves, bins and meter storage facilities. Standard overhead rack carries long sections of pipe without interference to cab door. Available in sizes for ½ and ¾ ton chassis.

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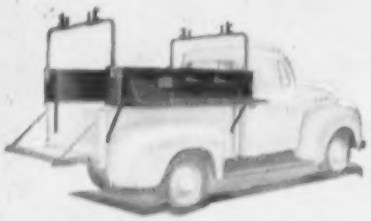
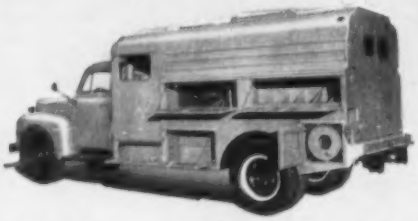
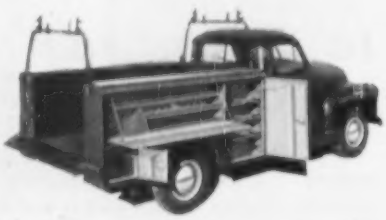
Need gas service, maintenance, or construction bodies? You'll find the unit for your work in the Powers-American line . . . whether you need one body or a hundred . . . in standard or special design. Standard bodies, built to meet known requirements of many companies, can be modified for your job, if desired. Assistance in developing custom-made equipment is yours for the asking.



SERIES UC Compartment Sections change your ½ or ¾ ton pick-up trucks into service vehicles. Finished in dark green enamel, and equipped with parts bins, as shown. Overhead rack is optional.



SERIES 500C Gas Line Construction and Maintenance Bodies are equipped with power take-off driven air compressor, hose reels, shelves, and bins. Built-in crew compartment seats four men comfortably.



SERIES 44 Bodies are designed for general service work, trouble-shooting, and appliance delivery. In ½, ¾, 1, and 1½ ton sizes. Built-in bins and shelves. Available with canopy-type steel roof.

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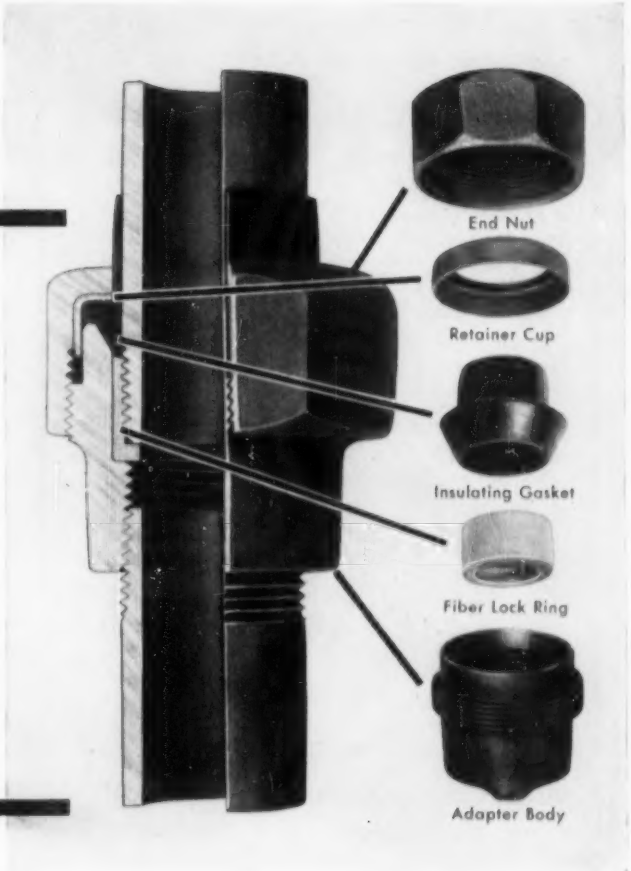
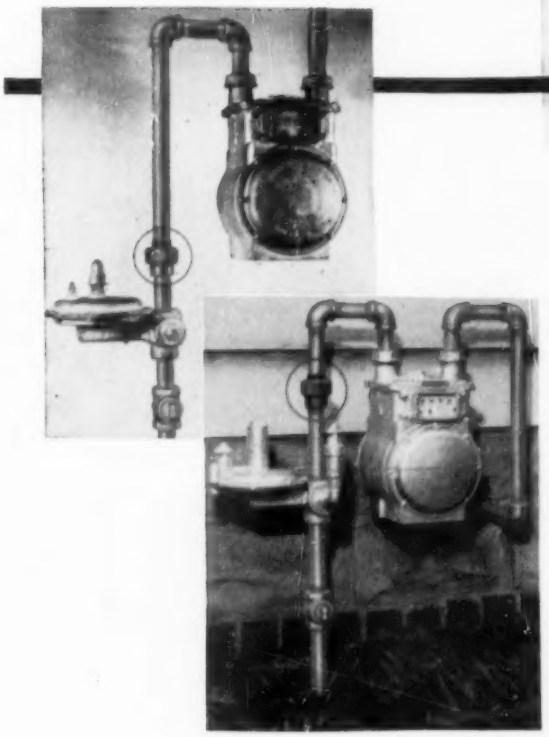
INSULOK

ADAPTER

seals gastight, resists pull-out, blocks current flow!





Since its introduction, the Dresser Style 90 Insulok* Adapter has become accepted throughout the gas industry for setting meters and regulators—inside the basement and out!

Installation is fast, foolproof, trouble-free. Positive sealing is maintained by the rubber gasket *built in*. To meet the unusual strains of basement hookups, the fitting design provides extra safety and resistance to pull-out. Rigidity for good meter settings is assured. Damaging currents between main and house are blocked effectively.

Insulok fittings are available for a variety of applications, in ¾", 1", and 1¼" sizes, in both male and female types. Wrench-installed like all other Dresser products, they go on quickly and easily, provide swift entrance into lines for servicing of meters and regulators, assure leakproof performance for life. Your Dresser Sales Engineer will give you full details.

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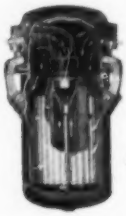
LIQUID FILTERS

Model HE (Sump)
Liquid Filter
Bulletin 330

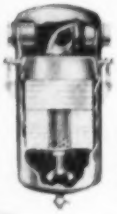
Model ELS (Pressure)
Liquid Filter
Bulletin 300

PIPE LINE FILTERS

Model CPH
Pipe Line Filter
Bulletin 200



Model CVH (Vacuum)
Pipe Line Filter
Bulletin 200

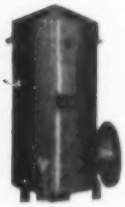


Model AAPHS
(Absorption)
Pipe Line Filter
Bulletin 200

Model HPH and AHPH
(High Pressure)
Pipe Line Filter
Bulletin 200

all types of FILTERS for every INDUSTRIAL NEED

AIR INTAKE FILTERS



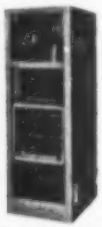
Model IDR
(Ground Level)
Air Intake Filter
Bulletin 100

Model DS (Silencer)
Air Intake Filter
Bulletin 100

Model D (Outdoor)
Air Intake Filter
Bulletin 100

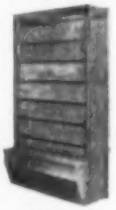
Model C (Indoor)
Air Intake Filter
Bulletin 100

VENTILATION FILTERS



Electro-Staynew
Mist Collector
Bulletin 420

Electro-Staynew
Precipitator
Bulletin 400



Automatic
Ventilation Filter
Bulletin 500

Dry and
Viscous Panel
Ventilation Filters
Bulletin 600 and 700

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

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Write, using Bulletin Numbers, for complete information on any of the Staynew filters illustrated. Consult Dollinger engineers on any special filtration problems—no obligation. Dept. 68 Centre Park, Rochester.

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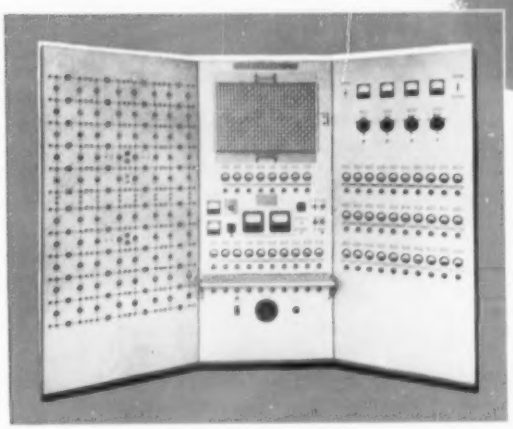
"LOOK WHAT HAPPENED"

to our plans when tested on the McILROY FLUID NETWORK ANALYZER

Important Hidden Weakness Quickly Revealed

Alternate Plans Quickly Devised and Successful Solution Developed in only 18 hours.



Are you doing distribution engineering of this high calibre? If not, you should know more about . . .

THE McILROY FLUID NETWORK ANALYZER

Write for engineering data

Since STANDARD 1884

THE TEST SHOWED:

that this section of proposed 12-inch main would not improve pressures as anticipated. Would have wasted thousands of dollars.

that a proposed source would improve conditions over too small an area.

that in three years new load growth would cancel out the slight benefits of our proposed plan.

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After testing 15 alternate, suggested plans, a final plan was selected which provided a proper margin of safety for predictable load growth, and assured maximum benefit for every dollar invested. This testing of alternate plans and development of the final, efficient, economical plan occupied only 18 hours on the McIlroy Analyzer.

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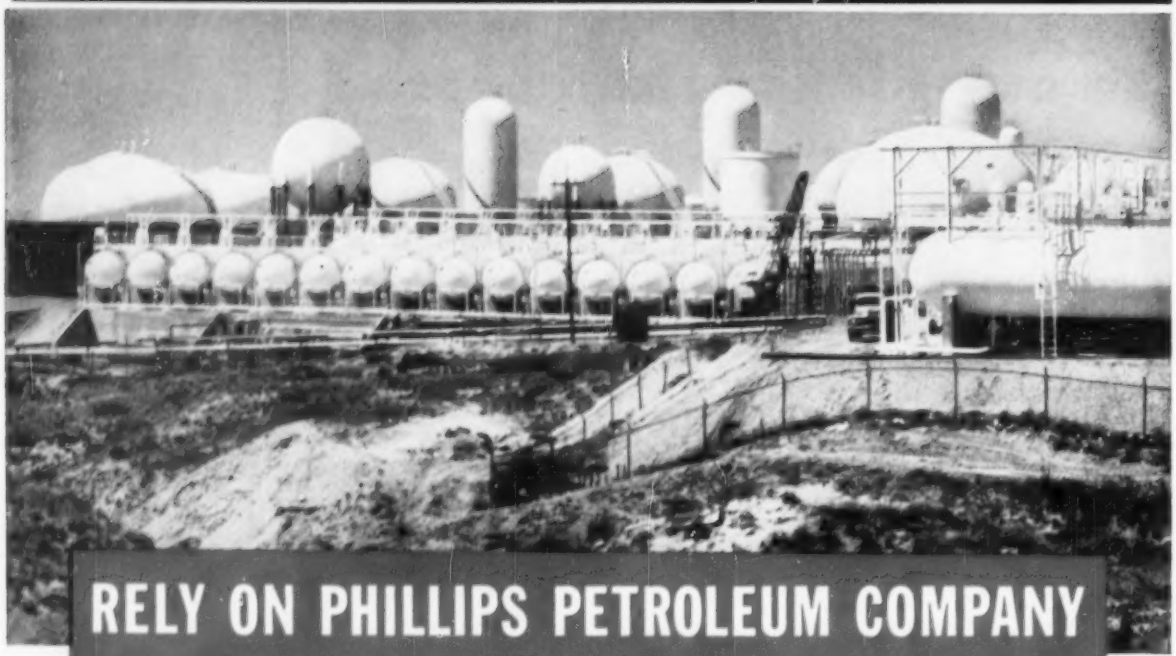

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A million new customers in 1955 helped push the gas industry to all-time record highs

By DEAN H. MITCHELL · AGA President

ONE of the most successful years in the history of the gas utility and pipeline industry has just been completed. During 1955 the industry reached new record highs in numbers of customers served with utility gas, in volumes of gas sold to ultimate consumers, and in revenues received from the sale of gas.

Reserves of natural gas at the beginning of 1955 were at an all-time high, despite a new record production figure in 1954. The industry added more than 1 million new customers during 1955.

Under approval of the FPC about 4500 miles of new line were authorized last year. More than 3000 miles of this actually was laid with the remaining 1500 miles under way at year-end.

More than 22,000 miles of gas distribution and storage pipeline, not requiring FPC approval, were constructed during the year. Today the total of natural gas gathering, transmission, distribution, and storage lines in the U. S. is more than 445,000 miles. With an additional 50,000 miles of line carrying manufactured and mixed gas, the nation's entire gas pipeline network is approaching ½ million miles, and will pass this mark in 1956.

Gas utility and pipeline companies spent approximately $1,385,000,000 for new construction and expansion of facilities during 1955. The industry expects to spend an additional $1,205,000,000 for such construction in 1956. Estimates made by the AGA bureau of statistics places total construction expenditures for the four years 1955-1958 at more than $4.3 billion. The gas industry now has nearly $16 billion in gross assets and is well on its way to becoming a $20 billion industry.

At the end of 1955, the utility industry was serving a new high of about 29,210,000 customers, including about 243,000 LPG customers served directly by gas utility companies. This was a gain of about 1,056,000 customers or a 3.8% increase over 1954, when the industry was serving about 28,154,000 residential, commercial, industrial and other customers. There were approximately 7.5 million customers served with L. P. gas in areas not on gas utility mains.

More than 24 million customers were receiving natural gas at the year-end, a gain of almost 2 million, and an increase of 8.4% over the 22,159,000 natural gas customers served at the end of 1954. Manufactured and mixed gas customers decreased to less than 5 million, a decline of 14%, as additional companies converted to use of straight natural gas.

Approximately 66.5 billion therms of gas were sold by gas utilities during the year, a new record and an 8.2% gain over the 61,428,200,000 therms sold in 1954.

Natural gas sales achieved a new high of 62,908,000,000 therms, up 8.4% over the 58 billion sold a year earlier. Manufactured and mixed gas sales totaled about 3,464,000,000 therms a 3.9% increase over 1954.

Revenues from utility sales of gas nearly reached the $3.5 billion mark, a gain of 13.8% over $3,052,000,000, the previous record high set in 1954. Natural gas revenues increased 16.2% to total $2,995,000,000, also an all-time high. Manufactured and mixed gas revenues were about $458 million, up 0.4% over the previous year.

Underground storage operations increased substantially during the year ending Dec. 31, 1954. At the start of 1955 there were 172 underground storage pools located in 17 states and an additional 12 pools were under construction. These active pools had an ultimate capacity of 1859 billion cu ft.

There are 6395 active storage wells in operation in the 172 pools. It is estimated that the 12 pools under construction would add nearly 200 billion cu ft of storage space for underground storage of natural gas. With new gas househeating customers estimated to be added for the next few years at a rate of about 1.2 million annually, underground storage of gas becomes an increasingly important factor in stabilizing the gas load.

Nearly $75 million was spent on construction of storage facilities in 1955; nearly $50 million will be spent on such facilities this year. It has been estimated that about $187 million will be spent on underground storage constructions in the years 1955-1958.

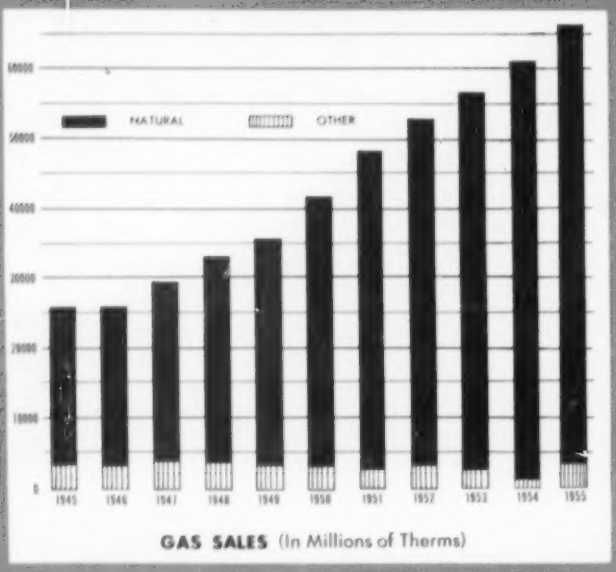
Proved recoverable reserves of natural gas at the beginning of 1955 had reached a new high level of 211.7 trillion cu ft, an increase of about 263 billion cu ft over reserves at the beginning of 1954. Production of natural gas in 1954 reached a new peak of 9.4 trillion cu ft, but new discoveries and extensions of revisions of previous estimates more than offset this use.

AGA statisticians estimate that a great potential market for sales of gas heating equipment exists in the U. S. today. With a maximum of promotional effort and product design improvement, the gas utility industry could sell more than 20 million gas heating units of all types in the next five years. Actual sales of such heating units in the five years ending in 1954 amounted to 15.1 million units. A potential market for nearly 60 million gas appliances of all types in the U. S. for the next five years if consumer purchasing power remains at present levels.

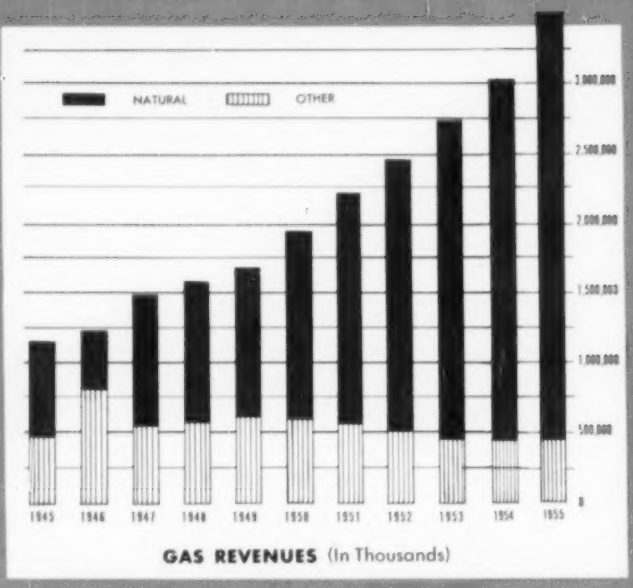
It is anticipated that space heating requirements in 1957 should be 53% ahead of 1954. Overall sales by gas utilities in 1957 could total about 75 billion therms.

To meet accelerating needs for gas service, the gas industry will require 6.2 million tons of steel pipe for the

Continued on page 38



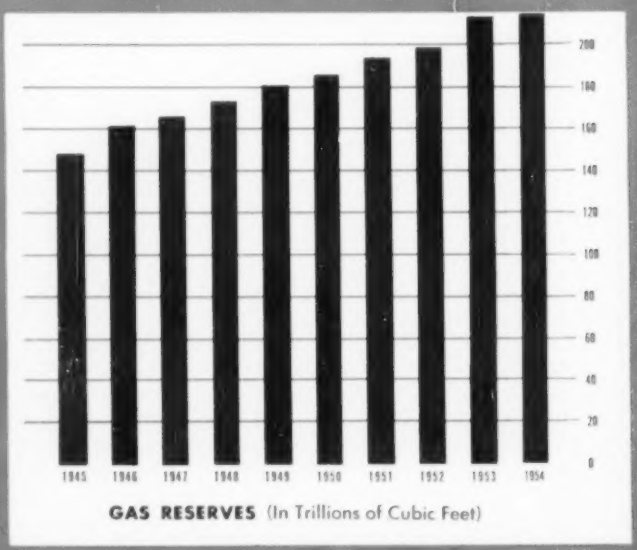
GAS SALES (In Millions of Therms)



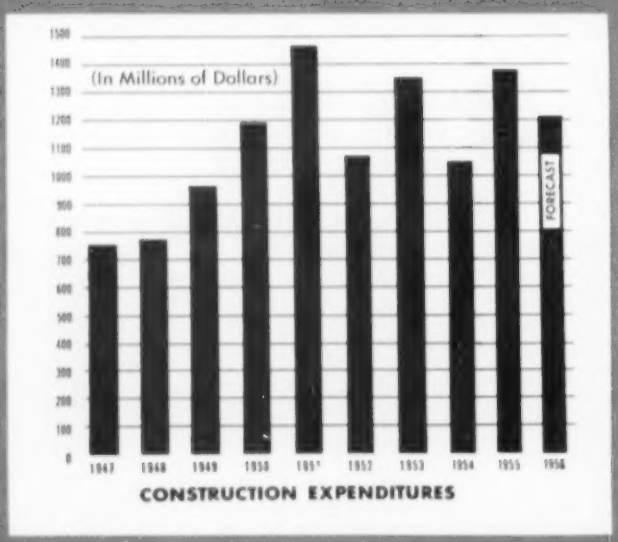
GAS REVENUES (In Thousands)

Inventory of the Gas Industry

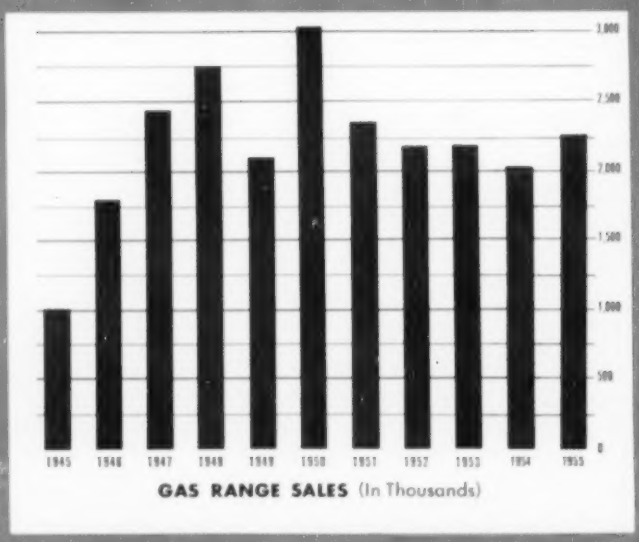
DECEMBER 31, 1955



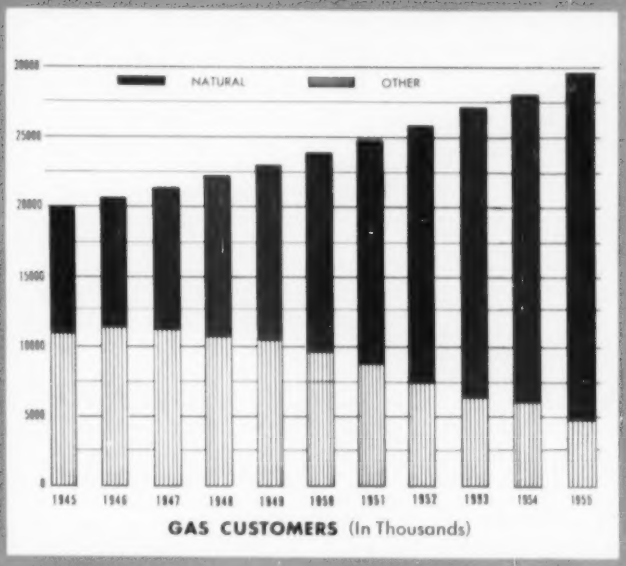
GAS RESERVES (In Trillions of Cubic Feet)



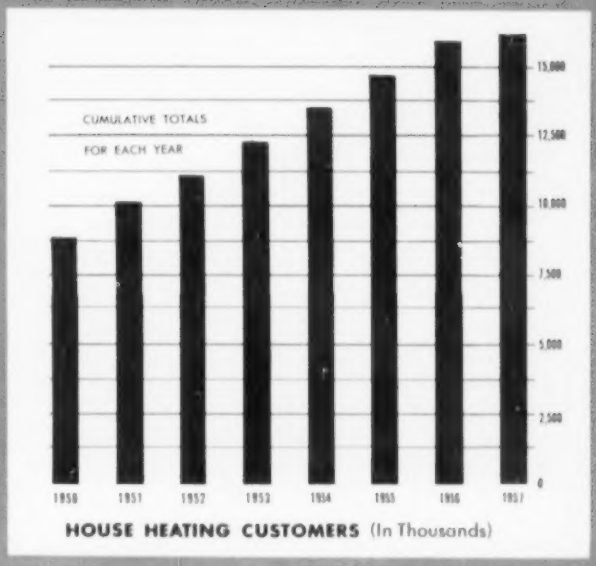
CONSTRUCTION EXPENDITURES



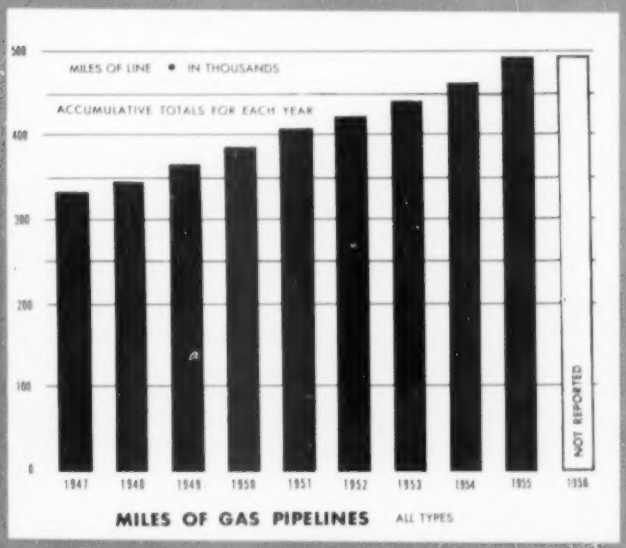
GAS RANGE SALES (In Thousands)



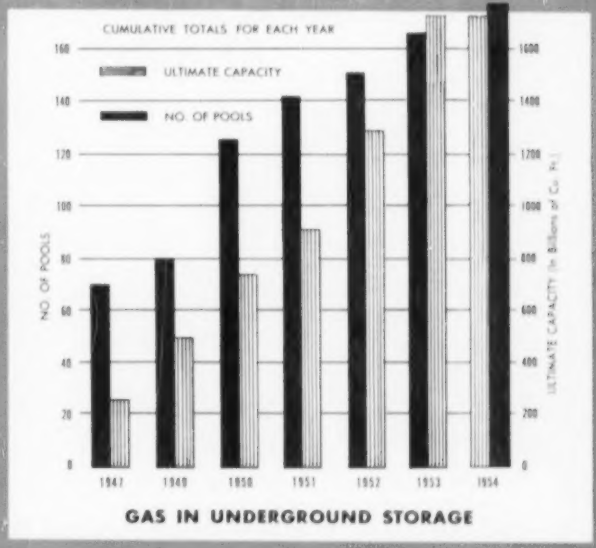
GAS CUSTOMERS (In Thousands)



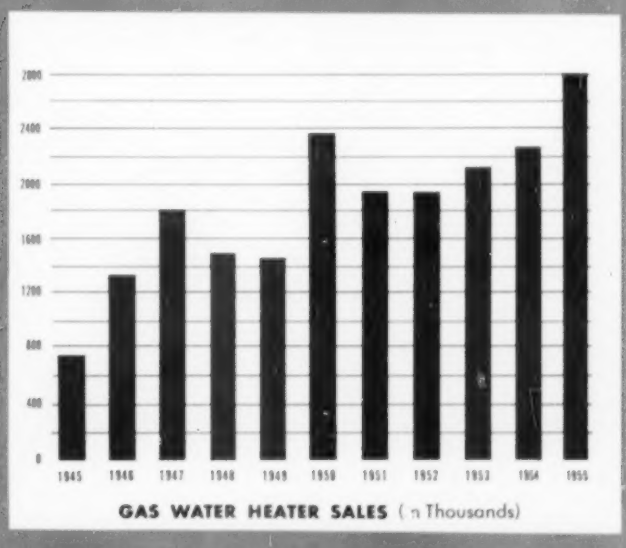
HOUSE HEATING CUSTOMERS (In Thousands)



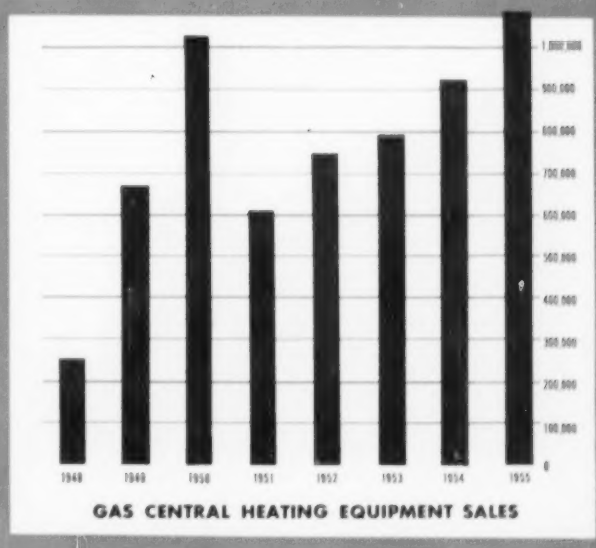
MILES OF GAS PIPELINES ALL TYPES



GAS IN UNDERGROUND STORAGE



GAS WATER HEATER SALES (n Thousands)



GAS CENTRAL HEATING EQUIPMENT SALES

"It doesn't take an expert to tell you business is good — not if you've got 36 million regular customers on the books and a million more all but knocking down the door," is the way W. F. Rockwell Jr., president Gas Appliance Manufacturers Association, feels about gas industry prospects. Here is the way the picture looked to him at year end:

The Recent Past	The Future
1955 was the greatest year yet.	1956 will be even better.
★	★
Water heaters: 2,799,000 shipped, up 22.7% over 1954. Not-overly-enthusiastic prognosticators last year only anticipated a 1 or 2% increase over 1954.	Same conservatism sees a "slight" increase in 1956. However, if pattern of '55 is repeated, sales might well top the 3-million mark for the first time.
★	★
Warm air furnaces shipped totaled 850,000 units, 30% above 1954 total, even more spectacular than water heaters. Boiler manufacturers also profited by trend to gas, increasing shipments by more than 13%.	Central heating with gas will surpass oil heating for the first time and by the end of the 1956-57 heating season will reach the 9-million mark, seven times the 1,292,000 gas heating plants in American homes in 1945.
★	★
Gas ranges, excluding built-ins, totaled 2,277,000 units, more than 12% over the 1954 total of 2,023,000.	Recently perfected automatic heat control for top burners will be one of the powerful sales stimulants that will substantially increase range sales in 1956.

"The introduction of natural gas in the Pacific Northwest is certain to bring a booming demand for gas conversion burners in that region. Two relatively new gas appliances — the gas clothes dryer and home incinerator — expect healthy increases. . . . And the makers of wall heaters, floor furnaces, and various types of direct heating equipment anticipate a quickening of interest in their new decorator-designed models and in the principle of zoned heating." President Rockwell also foresees continued increase in the use of industrial gas equipment since industry utilizes gas in a triple role: fuel, tool, or ingredient in the production of virtually every necessity of the nation's daily living.

Continued from page 35

1955-1958 period. Approximately 2.2 million tons of steel were used in 1955 alone. Of the total amount, about 3 million tons will be in the form of 16-in. or larger pipe, primarily used for natural gas transmission lines. An additional 199,000 tons of steel in other forms, and nearly 815,000 tons of cast iron will be required by the gas industry from 1955-1958.

Expanded facilities completed during the year, together with improvements in operating procedures, enabled the AGA Laboratories in Cleveland and Los Angeles to provide greater service to the industry. Approximately 5700 new models of gas appliances were tested during the past year. Approvals for Canadian manufacturing companies also increased substantially.

Central heating appliances accounted for more than 50% of the appliance-testing revenue. Testing of water heating equipment continued active, while domestic range activities centered around built-in sections, equipment with thermostatically controlled top burners, and low input pilots.

Eighteen PAR-financed research projects were under study at the Labs with emphasis on development of gas incinerators. Other research studies for domestic and commercial cooking, water and househeating and general gas utilization are under way.

The approval requirements committee adopted 15 revised appliance, accessory, and installation standards. More than 450 utility and manufacturer representatives were brought together through some 40 meetings to develop the new and revised appliance standards.

The second 10 years of the gas industry's PAR program began in 1955. Several new projects were initiated, including the $300,000, large-scale air conditioning research program, which resulted from recognition of the importance of an economical, competitively priced device.

A record of $2,341,293 was subscribed for the PAR program, making it one of the most successful years in its history. Of the total sum subscribed, $1,171,540 was designated for promotion and advertising, $1,109,753 for research, and about $60,000 for administration, including GID activities.

PAR's public information program made substantial progress. Nearly $100,000 was made available to this first year program. Materials are being furnished and workshops conducted to benefit gas companies wishing to start or augment their own public information activities. An economic information program to help develop greater awareness of the nation's vital stake in a strong, privately managed gas industry has been launched.

Twenty-three new subscribers were signed up to PAR last year—16 renewing their support after several years' lapse and seven making their first subscriptions.

PAR pipeline research also had record subscriptions of $250,385, although this was short of the $300,000 quota set.

More than $1 million was budgeted by the AGA last year for national advertising. Record-breaking all-gas spectaculars dominated this program for 1955.

The 10 Action Demonstration Cities continued active experimentation during the year with new and more intensive marketing, servicing, and advertising techniques. Several cities have adopted these techniques permanently. ■

"THE DECADE SINCE THE WAR"

1946 was the first full year of peace following the intonation of those fateful words by the man with the umbrella, which launched World War II. Dec. 31, 1955 marks the end of the first full decade since that war came to an end.

In 1956, the rawboned youth who fought that war has become the typical middle-aging gas executive. He has grown in stature and affluence, and with him has grown a mighty new industry. An industry that few not blessed with exceptional vision could have foreseen on that wonderful August day in 1945.

It may be difficult today to pick one's way through the past to the time when the war ended. It's hard to believe that only 10 years ago natural gas was still thousands of miles distant from homes that today are blessed with it. Or that housheating with gas was a pleasure barred to all but the wealthy, and that utilities throughout much of the northern half of the country were debating over whether they should even accept this load.

Technically, operationally, and saleswise the strides the industry has made have not been sensational, but the total result is highly impressive. There are lessons to be learned by taking an occasional glance over the shoulder. To help you take that glance at this time, the editors have prepared this special review of "The Decade Since the War."

In retrospect, progress is recounted in —

Distribution engineering and operation . . . page 40
Sales techniques and load building . . . . page 44
Methods of utilizing the fuel . . . . . page 48
Mobile radio communications . . . . . page 51

And in the Pipeline Section —

In pipeline design and operation . . . . page 107
In the growth of storage fields . . . . . page 111
In microwave communications . . . . . page 112

THE DECADE SINCE THE WAR

In the distribution operation, engineering has come into its own

By J. FRED EBDON, Editor

DISTRIBUTION system design and operation has advanced its technology since World War II under the influence of more research on a pure or theoretical plane and more engineering in operations. The engineers came into their own in many industries during and after the war. The world entered its technical age. Similarly this technology concept was carried to the gas industry and some of it was born therein. Engineers in gas companies found that their opinions meant more after the war and there has been a definite trend toward selecting top management from engineering people. This trend has made distribution operations more scientific and has advanced the art in the last 10 years —the decade since the war.

Pipe—the basic material

The most basic component of a distribution system for any kind of gas is the pipe. Many engineers detect a trend from cast iron to steel piping. Other materials have also been newly used or at least more accepted during the past 10 years. Many companies pre-

1 — "In more recent years, electric arc welding has entered the distribution picture on a nationwide scale. It is now widely used for the larger sizes of distribution mains. Many companies use arc welding for the majority of the work on all steel pipe above 4-in., for example."

2 — "A lot of pipe inserting has been done since 1945. This is an important usage that has been better used since the war, but, again, was not specifically developed within the decade. It is fairly common to see piping of one material inserted in piping of another material."

3 — "In the last 10 years, most gasmen have followed the news of plastics very carefully and intend to seriously consider it for their own use at some future date if they have not already done so."

1 2

fer and use cast iron pipe. But, the usage of steel piping for distribution mains has probably increased at a greater rate than has the same usage for cast iron. This is particularly true for the southern, southwestern, western, and West coast areas of the United States where natural gas is the predominant fuel gas distributed. Statistics indicate that in 1945 the ratio of miles of natural gas-carrying mains to manufactured gas-carrying mains was 113,-720 to 68,590. At the nd of 1954, the same ratio was 241,990 to 13,590. Mileage for mains carrying mixed gas for the same respective years was 17,-180 and 27,850.

Many factors are involved in piping and its components. Steel piping chemistry and production techniques have improved during the decade as have these factors for cast iron. Physical and dimensional standards have been improved for pipe of both materials. Allowable working pressures have also been increased. The development of the ASA Code for Pressure Piping, Section 8, B31.1.8—1955 was a major influence in the development of all piping materials to produce better products and to more specifically delineate conditions for proper use.

Pipe joints

Methods of joining pipe have certainly changed. Perhaps, not so much for cast iron pipe in distribution systems as in the case of steel pipe. Prior to 1945 there was not too much arc welding done to join steel pipes in the distribution side of the industry. The welding industry took giant strides in development of its techniques during World War II in the aircraft, shipbuilding, and other plants of the times. Both gas and arc welding came into their own after the conflict terminated. This is not to be construed to exclude welding prior to the war, particularly oxy-acetylene techniques. However, distribution engineers and operating men leaned toward screwed and mechanical joints for steel pipe until the advantages of oxy-acetylene, and later arc, welding became more widely recognized.

In the more recent years, electric arc welding has entered the distribution picture on a nationwide scale. It is now widely used for the larger sizes of distribution mains. Many companies now use arc welding for the majority of the work on all steel pipe above 4-in. nominal diameter, for example.

Mechanical couplings have been improved and the use of insulating couplings has become greatly accepted. This ternd has followed that of the acceptance of cathodic protection and coating as mutually operating systems for the prevention of corrosion in underground steel systems. The mechanical coupling is now, in many instances, regarded as a prime adjunct to produce flexibility at specific points in steel systems joined by welded joints. They have been developed so that certain styles can be used for joining different piping materials where welding would not be practical, such as palstic to steel or cast iron, steel to cast iron, copper to steel, etc., through numerous combinations. They are often used for this purpose and at the same time to produce an insulated fitting that will protect the systems from galvanic action at the joining point and prevent overstressing the systems by giving limited flexibility for movement. Several special styles of mechanical couplings have made their appearance on the scene in these progressive 10 years. Mechanical couplings are used to make a majority of the joints in many distribution systems.

Service lines

Service lines have not changed a great deal on a national basis, but the methods of connecting the services to mains has. Engineers tell us of the days just after World War II when things were hectic for the gas companies. They had just about as much expansion to do as physically could be done. Connections were made (we hope very seldom) by driving a malleable iron street tee into a cast iron main and then just screwing the service line into the outlet of the tee. This probably wasn't done on a large scale, but it was done.

As more and more steel pipe became installed in distribution operations, the forged-steel, welding service tee with a radius cut on the main end became more widely used. Many of these service tees had male threads on the top outlet and the branch or service line outlet was beveled for welding so that the service could be directly welded thereto. Other combinations have been developed and used. Devices for working the service connection under pres-

3

Distribution operation... Distribution operating pressures are up and continuing to increase

sure or without killing the main have been added and used. Integral valves have been designed into some service tees so the service line can be connected or killed at will. Not many, if any, of these methods were developed or invented since World War II, but most of them have been more widely used and are generally more accepted as standard procedures during the last decade.

Working under pressure

There has been a tendency to do more of the work on distribution systems while at normal operating pressure without letting gas blow. Ten years ago it was rather common practice to stab pipe against gas at distribution pressures blowing freely to the atmosphere. We can't even guess if managements knew that as much of this was being done as actually was, but the safety department and safety engineers have assumed greater importance in most companies, so most of this has been eliminated. Equipment for tapping, cutting, killing, and joining distribution piping without allowing any gas to blow to the atmosphere has been available for years, but is simply wasn't purchased and used on the scope that it has been during the years since 1945. Now, working without letting gas blow is much more of a standard engineering consideration. Equipment for the accomplishment of this objective has been steadily improved.

Piping insertions

A lot of pipe inserting has been done since 1945. This is an important usage that has been better used since the war, but, not specifically developed within the decade. It is fairly common to see piping of one material inserted in piping of another material. It started with some companies inserting steel pipe inside cast-iron pipe mains that were leaking or had joints that would not hold natural gas. Since then, copper and aluminum tubing has been inserted both cast iron and steel piping, plastic piping and tubing have been inserted into leaking steel services, and a variety of combinations have been tried and used to some extent. Perhaps one usually thinks of plastic tubing being inserted into leaking or broken services as the most prevalent usage of the principle today. Some companies used this idea as a standard practice, while many companies will not allow it at all.

Use of plastics

Plastic as a basic piping material is certainly an interesting development of the post-World War II years. The material is the subject of much discussion in the gas industry today and it is evident that the gas industry is not going to swing to it to any great extent right away. We may never swing to it, but gasmen everywhere follow each development with keen interest because plastic piping offers limitless savings if the material can be made and extruded into a product that the industry will accept as equivalent in every way to cast iron, more particularly, steel.

Some companies were investigating plastics for distribution system piping in 1942. Many have at least given it a try since then. Some have accepted it for use as material for insertion in older metallic pipe, some have grown to use it for service lines, some have installed it as mains by insertion in metallic existing piping, and some have used it bare for gas mains. Plastics are products of the wars—World War II and the Korean War. Acceptance flares up and dies down as far as direct use is concerned, but in the last 10 years, most gasmen have followed the news of plastics very carefully and intend to seriously consider it for their own use at some future date if they have not already done so.

Distribution pressures

Distribution operating pressures are up and are continuing to increase. The new concept is to serve the load on the system by increasing the pressure rather than maintaining a set, lower pressure and increasing the physical aspects of the system. Many companies have initiated conversion programs to change utilization pressure systems to intermediate or high pressure. Some companies have completely eliminated the utilization pressure systems that were carry-overs from earlier years. Others are converting these systems as their age and condition warrants it. The majority of this type of work has been done in the last 10 years. It is a wise move. It always seems a little wasteful to us to see steel pipe in the ground carrying ounces pressure when the pipe has been mill tested at 700 psig (for instance) and is raated by the ASA B31.1.8-1955 code for a design pressure of 420 psig. If the meters and service regulators have case pressure ratings that allow for intermediate or high pressure, and other components have adequate ratings, pressures in systems can be considerably raised to increase system capacity by packing rather than by increasing pipe diameter.

Gas meters

Meters have been reduced in size and weight during the dynamic decade. This trend started before the war, but has increased thereafter. The pressed aluminum case has come into its own and is being used more and more. Also, smaller capacity meters—as low as 60 cf/hr with ½-in. absorption—have come on the scene. We have heard much talk of the disposable meter, but have not seen it produced to date. Much work and experimenting with synthetic diaphragms has been done. They are steadily becoming of greater importance to the gas distribution companies.

Corrosion prevention

Cathodic protection and corrosion prevention in general have been given a lot of attention in the decade. It is difficult to draw conclusions on the subject but it looks as if a majority of companies have accepted the concept that combination corrosion prevention systems of cathodic protection and good protective coatings used together to mutually support the objectives of each have predominated in distribution. The advances in the technology of associated instruments, materials, devices, and procedures have been very outstanding, but too vast to detail here. One significant trend has been toward the use of carbon anodes instead of scrap iron groundbeds for rectifier-driven, cathodic protection installations. Internal pipe coatings of plastics other materials for corrosion prevention and to improve flow characteristics has been another major development.

"Communications have certainly entered the development picture in distribution engineering and operations more in the last 10 years than in all the time prior to 1945."

The distribution design engineers have had a field day as data processing methods have been improved and equipment for the more efficient and accurate use of these data has been put on the market. The mechanical and electronic data processing machines have given them data never before available. The digital computers and analogue network analzers have been the tools that have given them answers never before available or that were previously impractical for them to carry to final completion. Network analysis in general has been considerable improved. Engineers can now design with more experimental and empirical data than was available prior to the war. Much of the guesswork and rule-of-thumb type of design has been replaced with more classic approaches.

Communications and automation

Communications have certainly entered the development picture in distribution engineering and operations more in the last 10 years than in all the time prior to 1945. Microwave and VHF radio; various telemetering and control systems; automatic valve operators;other automatic devices for controlling pressure, additives, and flow; and the components of all these systems have really been accepted during this period. Some gas utilities have resisted the integration of such media into their properties, others have gone overboard on them, but all give them consideration on a scope never experienced prior to the war years.

Conclusions

The gas industry—particularly the natural gas part of it—has expanded at unpredicted rates since the war. This growth has resulted in the development of better distribution methods, materials, and design through necessity. Actually, very little is really new during the period 1945 to 1955 in the way of engineering. Most advances had been suggested or tried prior to that period, but the acceptance of the developments as routine or standard practices during this period has resulted in the real renaissance of distribution engineering. ■

In sales, a cavalcade of ideas

EVER hear of the Post-War Planning Committee?

Remember when Arthur Bridge, then president of the American Gas Association, said:

"The appointment by the association of a committee on post-war planning recognizes the vital necessity for preparing now to meet the stepped-up competition immediately following the cessation of hostilities and to prepare for the inevitable dislocation of industry . . . A survey conducted during the year brought out the fact that gas companies were in favor of having the AGA coordinate and supervise the research work of the industry."

Remember the PCGA Committee for Gas Industry Development? Remember when its chairman, Harry Masser of Southern California Gas Co., predicted:

"With the return to peace-time conditions we may well anticipate a material reduction in the volume of gas sales and corresponding revenues . . . Knowledge of probable reductions of gas sales is of importance to us for estimating expected net income and for meeting rate questions, and in considering operating economies. Doubtless after the war there will be greater necessity for effecting economies, for utility companies generally may decline in earnings to an extent to bring them below the line of excess profits taxes . . ."

Those estimates of the situation and predictions of things to come were made in 1943, when American industry was beginning to think about the future of the nation's economy. How misdirected were our fears for the future of economy, yet how right were these men in their predictions of future sales difficulties! As was to be expected, they accepted the analyses of the majority of the nation's leaders in parroting the forecasts of an "inevitable dislocation." But in pinpointing the future of gas within this larger picture, they showed keen insight.

They spoke of the threat by electric competition, and it has developed with a velocity that has kept the gas industry off balance for a decade. They talked of the need for upgrading of appliances, as a means of keeping sales leadership, and the soundness of this argument has been demonstrated repeatedly in the past 10 years. They felt that coordinated efforts in developing appliances, selling, advertising, and promoting them were indispensible—and the validity of this conviction has been continuously substantiated.

The gas industry had the men who could envision the future with exceptional accuracy. Looking back over the 10 years, we can see how right were their warnings. We can also see how valid those warnings are today, for tomorrow.

How far have we come in a decade?

The past 10 years has witnessed a cavalcade of ideas, dreams, schemes, and panaceas. There was the emergence of the New Freedom Gas Kitchen, the slow subsidence of CP into near-oblivion, the sometimes-Frankensteinian growth of househeating; PAR, the amalgamation of three separate activities into a single whole that has weathered adverse winds that threatened to dismember it; the wooing of war brides, so lately wooed and won in war-heightened tempo by their soldiering husbands, now the object of the blandishments of home service girls and gas appliance salesmen; the wooing of appliance dealers, now hot, now cold; the GID with its 10 test cities, where magic sales formulae are being hatched for some distant tomorrow; the Radiamatic range, Best Kept Secret of the Decade, and a miriad of other successes, failures, and in-betweens.

Holding the trump card of hindsight, of course, we can rather easily assay those lesser efforts for what they were. But in essence, the spirit of the decade has been one of striving against the odds of being a conservative utility in an unconservative age. The striving has not been in vain.

The gas industry was handed a makeshift, Jerry-built situation at war's end. We have, none can deny, come a long way. Much of the credit must go to the far-sighted members of the Post-War Planning Committee and the AGA board of directors of that era for giving the industry a pattern in which to mold its tomorrows.

A. M. Beebee of Rochester (N. Y.) Gas headed up the committee. Serving with him were C. V. Sorenson, Northern Indiana Public Service, Hammond; R. J. Rutherford, Worcester (Mass.) Gas; R. E. Ginna, Rochester; W. C. Beckjord, Cincinnati Gas; and Hall Henry, Negea. The committee proposed to study postwar purchasing power and potential markets, factors affecting the realization of the potential markets, engineering and economic aspects of the industry's own ability to satisfy the potential market, and the effect of national planning trends.

A. F. Bridge

H. L. Masser

In 1943 when Arthur Bridge was president of the AGA, a post-war planning committee was established to prepare the industry for the challenges that were anticipated when peace returned.

An inevitable dislocation of industry was forecast by such gas industry leaders as Harry Masser, who headed up the wartime PCGA committee for gas industry development.

By January 1945, J. French Robinson, then president of the AGA and of the East Ohio Gas Co., was able to report that the committee's studies had resulted in the allocation of $1.4 million annually for three years to an increased budget for research, advertising, and promotion. He also told of the determination of utilities to promote "New Freedom Gas Kitchens," a term that was to be advertised extensively in that year. In between times, the committee had come forth with a 31-point table of recommendations, which included such random suggestions as these:

"11. Each utility should study the potentialities in the housheating and year-around air conditioning fields by first-hand practical experience.

"18. Needless special appliance requirements of individual companies should be eliminated in order to reduce manufacturing expense.

"19. Unnecessary multiplicity of models should be avoided so as to lower manufacturing costs of appliances.

"21. Each operating gas utility should assume leadership in merchandising in its area, whether it merchandises directly or through dealers or a combination of both.

"27. The coal and manufactured gas industry should realize and develop their community of interest.

"28. Our industry should consider cooperation with the liquefied petroleum gas industry, particularly in serving fringe territory."

Other pertinent passages recommended support of the national advertising program, stressing ranges in advertising, support of sound insulation programs, coordination of efforts in sales, research, and advertising with manufacturers, etc.

Some of these recommendations would still have value today. Air conditioning experience is only now being built up; special utility requirements (SUR) are dying, but slowly; merchandising policy remains a matter of contention on a national as well as a regional basis; the LPG industry is only now being considered, generally, as a worthy partner in the battle of the fuels.

Other aims of the committee have long since lost their validity. The "manufactured gas industry" cannot very well clasp the coal industry to its bosom because it is becoming, more and more, the "natural gas industry." Unnecessary multiplicity of models is not generally considered a problem, because manufacturing costs are not the bugaboo they once were. Costs have gone out of sight, it's true; but we need worry no longer about raising our retail prices, and then raising them again. Up to a point, that is.

Concurrently with the announcement of the general committee, the engineering and economic phases subcommittee was drawing up some recommendations of its own. It found that equipment was adequate to meet competitive threats, but that certain parts needed strengthening to reduce servicing costs. It found a real need for a "fully automatic safe lighting pilot." More research such as would reduce the cost of distribution facilities to permit heating loads to be served was also urged. Studies of comparative fuel costs were recommended.

The tempo of planning began to be stepped up as the year 1945 got under way. PCGA came forth with a statistical survey indicating the potential in its area. Other surveys were being made by outside interests purporting to show the housewife's preference in appliances, and the price she was willing to pay, and gas was not getting all the best of it. Some of the facts were quite disturbing, if accepted at face value.

In November, the late Elliott Taylor, onetime editorial director of *GAS*, took note of the fact that manufactured gas utilities were spending a great deal of effort in searching for new production methods that would shave peak costs sufficiently to make housheating economical. (It was being widely recognized that the housheating load would be badly needed as a means of holding the kitchen load.) Mr. Taylor had his own recommendation: look to natural gas.

In the same month, *GAS* passed along the report of Ernest Acker, then chairman of the AGA promotion committee, on expenditures, allocations, and accomplishments and plans for the combined promotion, research, and advertising campaign for the first and second years. A promotional bureau was established, and Col. John H. White Jr. of Rochester was named bureau director. AGA proposed to spend $100,000 on CP promotion, with comparable programs set up for water heating and housheating.

In the West, PCGA published a water heater sizing chart as a means of generating interest in upsizing water heaters.

In New York, Chase National Bank was announcing utility appliance financing plan.

A. M. Beebee

R. J. Rutherford

R. E. Ginna

W. C. Beckjord

H. M. Henry

Much of the credit for progress during the decade must go to members of the post-war planning committee, such as Alexander Beebee of Rochester Gas, who served as industry chairman. Other members included R. J. Rutherford, R. E. Ginna, W. C. Beckjord, Hall Henry, and C. V. Sorenson (not pictured).

In Wisconsin, the utilities were pledging their determination to aid dealers in every possible way short of subsidy.

GAMA was deciding to raise its own fund instead of throwing it into the AGA pot.

And that was just about the way the stage was set as the decade 1946-55 began. Except, of course, for the statistics. The year-end report by Everett Boothby, AGA president, showed we had . . .

20,156,000 customers, an increase of 1.9% over the previous year.

(In 1956, we have 29,210,000, an increase of nearly one-third in 10 years.)

Revenues of $1,141,374,000, up 3%.

(In 1955, we had revenues of $3,473,328,000—three times those of 1945.)

Gas sales aggregating 25,867,700,000 therms.

(In 1955, we sold 66,500,000,000 therms—2½ times those of 1945.)

Sales of 1 million ranges, up from 625,000.

(In 1955, range sales climbed to 2,280,000.)

J. F. Robinson

By January 1945, J. French Robinson was able to report that the postwar planning committee studies had resulted in the allocation of $1.4 million annually for three years to an increased budget for research, advertising, and promotion.

Those few statistics give an indication of the distance we have traveled in the 10 years. A glance at the "Inventory of the Gas Industry" spread on pages 36, 37 will give a broader picture. And while the total result looks gratifying, there has been a great deal of concern over the failure of sales of basic kitchen appliances to match the sales of the fuel itself. Along the way, great expenditures of effort have been made, frequently in spurts, and progress has been made. Today's appliance census bears no resemblance to pre-war totals. But it is generally accepted that it has failed to live up to its potentials.

The first efforts were directed toward sewing up the rents in the pre-war sales patterns. An epidemic of brides' classes in homemaking broke out in almost every major gas distribution center. A strong emphasis was placed on nutrition, and instruction centered around the care and feeding of children. Kitchen planning bureaus began springing up in many utilities throughout the U. S., reflecting the general optimism on the home building outlook. A million homes a year appeared to be a sound estimate of growth, and gas companies were plotting ways to pick up this new load.

Dealers once more became objects of utility affection. Typical of the methods that were concocted for wooing them were the Blue Seal plan of Southern California Gas Co. and the Blue Flame plan of SoCounties, under which a cooperating dealer would receive special help in return for throwing his lot in with the gas utilities. Brooklyn Union had an outstanding plumber-dealer cooperative scheme that built up both the dealers and the fuel.

At the end of the first year of the decade, the late Reginald Hargrove, then president of AGA, reported that numbers of customers, units of gas sales, and revenues had all recorded moderate gains of from about 2½ to 5%.

"By far the most outstanding phenomenon of the year was the tremendous demand for househeating," said Mr. Hargrove. "Not only in the existing market, but in the new home field, a strong preference for gas was apparent. The National Housing Agency, for example, recently reported that of the 629,000 dwelling units planned under the veterans' emergency housing program up to July 26, 1946, gas heating systems were specified in 52%. All factors considered, creditable levels of appliance production were attained at year's end."

"Creditable levels" meant 1,250,000 automatic gas water heaters—an all-time high to that date; 1.6 million gas ranges; 600,000 gas househeating units. It is interesting to note that water heaters have since taken the play away from ranges as top appliance seller, and sales of all types of househeating equipment have moved into a challenging position.

Harold Massey, then assisting managing director of GAMA, sized up production schedules for 1947 and announced that further growth could be anticipated, but that steel strikes might hold the key to the situation.

Mr. Massey also found promise in a relatively new appliance—the clothes dryer. Surveys showed, he said, that 20 to 30% of housewives interviewed were interested in a dryer. One out of 10 washer users is a potential buyer, it was said. Moreover, gas was scheduled to capture a good share of this market.

"A large manufacturer of dryers expects that two-thirds of the dryers that he will sell in 1957 will be gas, because it is easier to install and cheaper to operate," said Mr. Massey. "It will be recommended in every case where gas is used for cooking."

(Unfortunately, gas clothes dryers were slow to win recognition, as it turned out, and their electric counterparts got off to a good head start. Even now, gas clothes dryers are working hard to catch up. To those timid souls who sell gas on the basis of price alone, the higher first cost of gas models has proved to be a stumbling block.)

Within the chorus of conservatively optimistic voices a few skeptics were beginning to blow a sour note or two. Stanley Jenks, writing in April 1947 *GAS*, quoted Robert Ginna's prediction that in 1947, the ratio of gas water heaters to electric would drop to 2.4 to 1, of ranges to 1.8 to 1. "Sounds preposterous, doesn't it?" was the Jenks comment.

The same month Raymond Little, then sales manager of Equitable Gas Co., Pittsburgh, was taking note of the quick demise of the Postwar Blueprint. Deluged with heating demands, especially conversion burners, utilities were finding it necessary to place the emphasis on the search for increased supplies of gas rather than developing the market. The postwar planning committee's report, issued late in 1946, took note of this situation (said Little). He quoted the report at length where it touched on the encroachment of electricity, including the prediction that "in the not-too-distant future, gas companies will no doubt consider househeating as also a part of the base load."

Little also referred to the potential threats of the heat pump, and of atomic energy. Guy Corfield, writing in *GAS*, also devoted a column to heat pumps and their possibilities as competition to gas househeating equipment.

In June, Stanley Jenks passed along the complaint of dealers that they were getting stuck with unsold gas heaters as companies began curtailing new househeating installations.

All of a sudden, in some lines, supply was even farther behind demand than ever. Gas had entered an era when it had simultaneously to encourage and

R. Hargrove

"By far the most outstanding phenomenon of the year was the tremendous demand for househeating," said Reginald Hargrove, AGA president, reporting on the industry at the end of the first year of the new decade.

Harold Massey

Steel strikes were holding the key to the application production situation in 1947 and other early years in the decade, according to Harold Massey of GAMA.

discourage new customers. As fast as vitamin injections added new growth on one arm, a drastic pruning removed almost as much from another.

The biggest single dose of vitamins was in the form of the "Gas Has Got It" campaign, which came along in the following October. This effort was hatched as the result of an Elmo Roper survey, sponsored by AGA, which purported to show what women wanted in new appliances. What they wanted, gas had got—this was the rather ungrammatical idea that was to be exploited in promotion and advertising.

The Roper survey also unearthed some findings calculated to knock the props out from under the gas industry's lethargy. For example, CP was not the smashing success it might have been; 68% of women interviewed didn't even know what "CP" meant.

"Gas Has Got It" enjoyed a rather long life, but was no panacea. Under its banner, however, a number of good advertising and promotional ideas were created and carried out.

Despite all these conditions, ideas, and promotions, the steel shortage continued to command the situation through the year 1947 and on through 1958. But in the latter year, while everyone waited apprehensively for the "buyers' market" to materialize, sales enjoyed a smart increase all up and down the line.

Then came 1949, and it appeared that some of the more pessimistic predictions were going to come true at last appliance sales showed a moderate but widespread dip. But 1950 was right back on the track, and gas appliance sales enjoyed the greatest year in history. Spurred by the Korean war, sales in the last half-year carried the year's totals to new highs in ranges (3.1 million units), water heaters (2,250,000 units), and central heating (1 million plus 3.) The "Sell 'em Comfort" heating campaign was launched, and surveys by *GAS* and other agencies were showing that restrictions were easing throughout the country. Early Bird campaigns were also started. The automatic ignition field study also was born in that year.

With 1951, the second half of our decade starts. Patterns, by this time, were pretty well set. PAR was established. (As will be noted in the latest annual report of the AGA president, it is still a major cog in the association's machinery.) And although the war that year was keeping everyone upset and beclouding the future, it proved to be only a temporary influence on the market. Like the "recession" of 1953, it appeared to have no lasting effect on the appliance market, except as a spur to raise late 1950 sales to record highs, still unmatched in some lines, and to start a later reaction that has since been rectified.

Byproduct of the war

One byproduct of the brief war that merits mention, however, was the controversial series of orders issued by the Petroleum Administration for Defense, the first of which was brought forth in August 1951. These were set up to restrict new househeating installations on a nationwide basis. The reaction was immediate and, in some quarters, vociferous. After the first order had been promulgated, PAD did some backpedaling and brought the state PUC's, which had been handling their own restrictions, into the picture. Although the orders were kept in effect into 1953, they had long since been pretty well emasculated by amendments permitting states PUC's to certify they were handling their own problems.

Shaking off the effects of such temporary annoyances, the industry in 1953 embarked on a grand new scheme—GID, the Gas Industry Development Program, "Action" was the byword, and at a rousing luncheon session at the St. Louis convention that year at which everyone present slipped off his jacket, the industry's leaders pledged a real "Coats Off for Action" campaign.

GID is still with us, but it is not an unalloyed success. The many pledges which both AGA and GAMA took are being followed only to a point consistent with other considerations. One hundred percent subscriptions to these ideals has been lacking on both sides. Business has been good, and 1955 sales were at high levels, but in the midst of this happy atmosphere, manufacturers have been consolidating and making other drastic changes to keep from going under. GID has not yet wrought any major miracles, and by the time all the "test cities" have been throughly tested, enthusiasm will likely have reached a nadir.

Excellent progress

But away from the hooraws and the drumbeats of promotion, some excellent progress in basic appliances improvements has been taking place. The heartwarming cooperation between utilities and manufacturers at the laboratory level has brought forth some basic improvements that are enabling gas appliance sales to hold their own in today's world of kitchen glamor. Gas ranges offer a world of advantages that attract, too. Water heaters are becoming pretty enough to come out in the open at last. Gas all-year air conditioning at an attractive price is almost here. After all, the most important thing is the product itself.

Still, there will always be a new competitive factor arising to replace the old. There will be the heat pump, the fast-recovery electric water heater, and that newest and most glamorous of all—the electronic oven.

Hold your hats! Here comes another decade! ■

Ray Little

The overwhelming demand for gas for such use as househeating caused utilities to generally disregard the elaborate plans they had made for postwar market development, it was noted by Raymond Little, then sales manager of Equitable Gas Co.

Developments in gas utilization during the past decade

By GUY CORFIELD • Technical Editor

THE past decade in gas utilization methods and equipment has been characterized more by modifications and improvements than by any startling innovations. A number of ideas that are not completely new have been tested and put into practical usage during this time.

A number of improvements have been built into gas ranges and means of modernizing them and making them more convenient for the housewife have been developed.

The separated top and oven-broiler sections built into a counter, and into wall or cpuboard space, respectively, are now used in many new and remodeled kitchens.

Hoods with forced ventilation immediately above the range to carry off the combustion products, cooking odors, and vapors before they can escape into the kitchen and adjacent space, are also conventionally installed.

Low input pilot flames (hypodermic needle, Mini-pilots) to reduce standby heat, modified and streamlined top burner grate assemblies (such as the nickel burner), thermostatic and time-controlled topburners, and revolving spits in broilers have also improved and modernized today's gas ranges.

Water heaters have undergone some basic changes in the way of improvements, including diversification of tank materials and internal coatings. Among other choices, the user may pick the copper tank or glass-lined models. Table-top models are available for incorporation in kitchen counter space, and tank casings have been streamlined and decorated to present a pleasing appearance to go along with the new kitchen styling trend.

Most water heater lines include magnesium anodes to control corrosion, and there are a number of high-input, fast recovery and higher delivered water temperature models to meet the expanding requirements of household dish washers, laundries, etc.

In general, there has been considerable activity and ingenuity in the design and development of warm air heating systems, spurred by the trend to basementless and slab-floor homes and the reduction in size of houses and space allotted to heating equipment.

Among newer types of warm air heating appliances are vented recessed heaters, attic (horizontal) furnaces, closet and alcove furnaces, and downflow furnaces (discharging heated air into plenums or ducts below the floor). New heating systems include perimeter, baseboard and radiant-floor applications; box plenum and extended box plenum warm air distribution systems; and B-W vent pipe to meet the problem of venting through narrow wall and partition spaces.

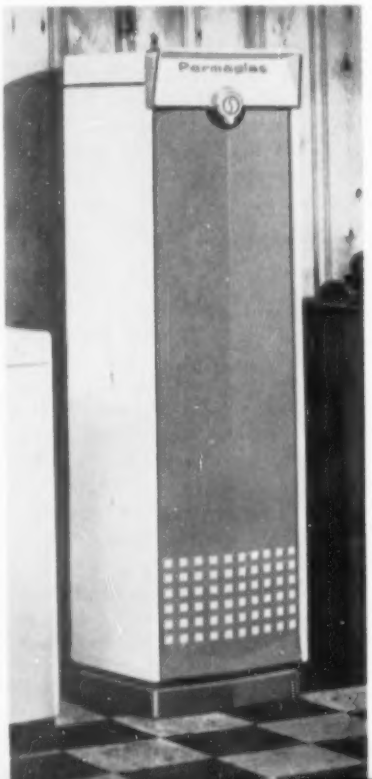
There has also been some acceptance and use of stainless and coated steel in place of black iron for fire boxes, heat exchangers, baffles, and other parts subject to heat and corrosion, which has permitted lighter and more compact design.

In the refrigeration field, Servel's Ice-Maker, which automatically produces ice cubes as required, has been an outstanding achievement. There has also been a general enlargement of freezing space, permitting storage of frozen foods. Automatic defrost mechanisms have also added to performance and convenience.

Among "new" domestic appliances, the clothes dryer is enjoying recent and increasing acceptance, even in areas where it is not difficult to dry clothes outdoors. Incinerators or garbage disposals are being installed in many areas

In the commercial appliance field, deep-fat fryers have progressively increased in speed and efficiency and have maintained their lead over competitive equipment. Another trend has been

"Streamlined and colorful tank casings, together with basic operational improvements, have been developed by water heater manufacturers."



"Low input pilot flames, thermostatic and time-controlled top burners and revolving spits in broilers are featured on many new gas ranges."

to dry food tables, replacing those heated by steam.

Industrial uses of gas fuel are almost infinite in type and number, depending on the process and environment. Their development has been largely controlled by and geared to the advances and diversification of industry itself. In many instances, the flexibility and controllability of gas has been responsible for improved industrial processes. Modern, and in some instances exclusive, gas appliances are:

Production-line heating, by battery of furnaces, in tube mill to reheat seamless tubing for finishing operations.

Treating of carbon steel by rapid heating and instant quenching.

Continuous and fully automatic integrated heat treating production lines for carburizing, hardening, and drawing steel.

Provision of prepared atmospheres to prevent metal scaling, accomplish carbon restoration, etc.

Rapid heat transfer by high combustion rates, with controllability to surface or spot heat only, if desired.

Flame control, to spread heat over large surfaces or long distances, or concentrate it, as required.

Controlled drying, rapid when necessary, of printed paper and other sheet materials, decorative finishes, and a great variety of industrial and agricultural products.

Under consideration and trial is an all-out program to develop domestic and small commercial summer air conditioning (cooling) equipment, combined with winter heating equipment, to supply mass market for all-year home air conditioning and comfort. Related to this is the study of the design of air duct and register systems, to distribute warm air in winter and cool air in summer with equal effectiveness through the same system.

Work is being done on domestic incinerators and garbage disposals to achieve complete elimination of smoke, odor and particulate matter discharge so that they will meet the most rigid air pollution control requirements.

It is often difficult to achieve complete separation of appliances and applications from the AGA approval requirements organization and operation. Appliances and accessories are constructed and installed to comply with AGA approval and listing requirements, which are modified and extended as new appliance developments appear.

Generally, the trend in the area of approval and listing requirements has been toward the development of *performance* rather than *construction* requirements, to avoid restriction of manufacturing ingenuity and to enable the use of new methods and materials.

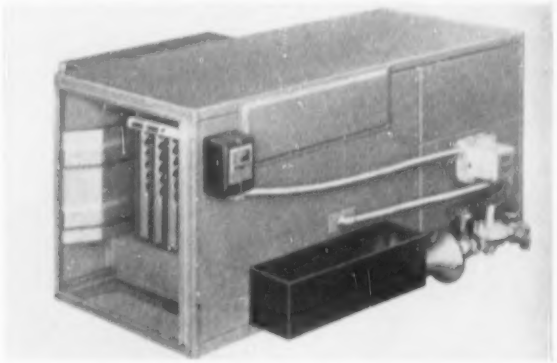
There has also been periodic upgrad-grading of appliances' of control and convenience features, etc.

The addition of requirements for electrical components of gas appliances to insure that wiring, switches, motors, etc., meet recognized national standards has been an important step in keeping with the increased complexity of appliances, particularly ranges and central heating furnaces.

Scheduling two meetings per year of the approval requirements committee (rather than the earlier one meeting per year), will enable continued prompt consideration of "Natural Gas Only (Optional)" requirements, in view of the extended distribution of natural gas, so that appliances designed for natural gas use need not be constructed or equipped to operate on all gases.

On gas ranges, requires top burner efficiency has been increased from 40 to 45%, and the following have been made mandatory: automatic ignition of all top burners, automatic ignition of all burners (effective Jan. 1, 1957), thermostatic control of ovens (domestic), and thermostats on bake ovens.

". . . There has been considerable activity and ingenuity in the design and development of warm air heating systems, spurred by the trend to basementless and slab-floor homes . . ."



"Depending on the process and environment, gas usage in industrial applications is almost infinite in type and number. Gas has proved responsible in many instances for improved industrial processes."

"The gas clothes dryer, among newer appliances, is finding widespread acceptance."

In addition, top panel temperatures above pilots cannot now exceed 70°F (above room temperature of 70°F); separate broiler heat-up speed (to 530°F above room temperature) has been reduced from 16 to 12 minutes; no leakage of combustion products, which may soil the wall in back of the range, from oven and broiler flue systems is permitted.

The number and variety of types of central heating equipment has become so complex that four subdivisions have been formed, and volumes of printed requirements issued, as follows:

Steam and hot water boilers,
gravity and forced air central furnaces,
gravity and fan-type floor furnaces,
gravity and fan-type vented recessed heaters.

Panels, advisory to the central heating subcommittee, have been appointed to develop and recommend changes and additions to requirements, thus conserving time of the subcommittee.

Optional approval can now be obtained for furnaces for alcove or closet installations, and requirements have been developed for vented recessed heaters, stressing tests conducted under simulated conditions of wall installation including vent pipe to ceiling.

The title of the requirements for flexible gas tubing has been changed to Gas Hose for Portable Gas Appliances to stress the limited use for which such tubing is approved. Also, the title of the requirements for semi-rigid tubing and fittings and flexible metal tubing and fittings has been changed to Metal Connectors for Gas Appliances, with revisions and elimination of requirements for tubing within appliances.

New requirements have been issued for appliance gas pressure regulators (Jan. 1, 1956), automatic pilots (Jan. 1, 1952); automatic valves (Jan. 1, 1953), and gas valves (Jan. 1, 1955).

A revised edition (November 1954) of Installation of Gas Piping and Gas Appliances in Buildings has been issued.

Concurrent with these developments, the AGA-PAR program produced or sponsored an imposing array of research bulletins: 81 devoted to domestic utilization and nine covering commercial and industrial applications.*

The subject of interchangeability alone has been covered in seven different studies covering coke oven gas, carburetted water gases, and various mixtures of gas along with the study of possible burner adjustment indicator devices.

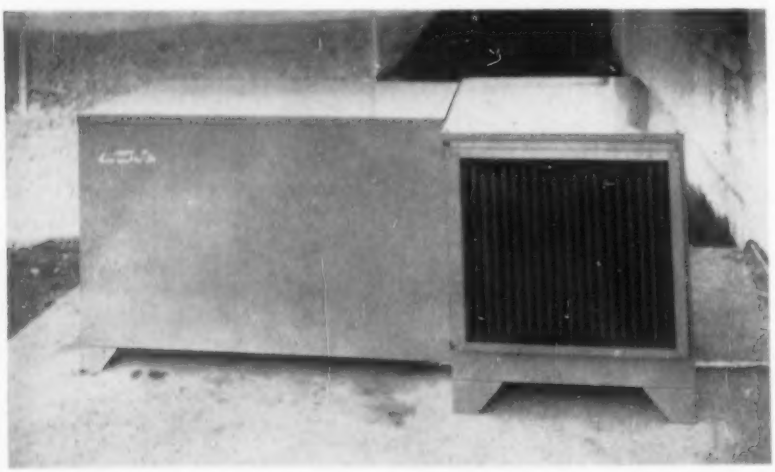
Burners and accessories have been covered in a large number of studies (26 in all). Among the facets of this subject that have been taken up are atmospheric gas burners; noise of extinction of large gas burners; extent of gas flame impingement allowable for satisfactory combustion; automatic plug-in connectors; flash-back characteristics; research in gum, dust and rust filters; forced combustion; and combustive characteristics.

The automatic range ignition field test program, which was undertaken as a means of developing cooler ranges, also was the subject of reports. Publications covering research on ranges and cooking took up such matters as oven heat distribution, heat absorption by utensils in ovens, kitchen ventilation, broiler design, top burner ignition, and various methods of cooking.

Water heating research was also made the subject of a number of investigations, including research into special types of burners, condensation, uniform temperature water flow, relief devices, installation methods, table-top water heaters, and corrosion.

Heating and air conditioning was the subject of 21 studies covering modulated operation of warm air furnaces, effects of confined space installation, heat transfer, air supply, venting, hot water service from boilers, corrosion, pressure losses, and performance of various types of systems. ■

"Built-in ovens and top burners units are popular in new and remodeled kitchens."



"An all-out effort is being made to develop air conditioning equipment for the mass market."

*A listing of these publications, and individual copies, can be obtained from AGA headquarters.

By FRANK M. CHAPMAN
Publisher

THE DECADE SINCE THE WAR

The ever increasing importance of mobile radio facilities

THE flood had crested at seven that evening and the water was rapidly receding. Gas company crews had been on duty for hours standing guard at all of the company's vital installations. Most wire-line communications facilities, along with much of the area's electric power, had been out of service since the water reached flood stage early that morning. Mobile radio communication had been called upon as the only means for dispatching emergency crews from location to location as the need arose. Police, fire and civil defense crews had also called on gas company communication facilities to augment their own mobile radio systems.

For several days following the disaster the company continued to rely on its mobile radio communication facilities for dispatching work crews. As flood waters receded, the company was faced with the usual load of leak reports from all sources and it was necessary to run down each one to assure that some major leak had not developed. All things considered, it was many days after the flood before a semblance of normal operation could be assumed.

All through the entire period of the disaster it appeared that the most matter-of-fact facility was the company's mobile radio communications system. None the less, the one single link that remained between many of the company's operations during the period was its radio—a facility that was unknown to gas company operations a scant 15 to 20 years ago.

Most gas companies used mobile radio communication prior to 1945, but it has been during the "decade since the war" that the gas industry's mobile radio facilities have come into their own.

This has not, of course, been a development that has been relegated solely to the gas industry. The use of mobile radio communication facilities has expanded with equal speed on a number of different fronts. In an address before the National Association of Radio & Television Broadcasters' regional conference, in Chicago, Federal Communications Commissioner Robert E. Lee, said "The forty-fold increase in the number of industrial and land transportation users of two-way

". . . In order to cut in a gate valve, safety demands that the line be purged with air, inert gas, water, etc., at the point where the work will be done and between the valves or stopping equipment controlling the gas flow. Thus the transferring of information among three field operations . . . is necessary . . . and this can be done with mobile radio and additional communication facilities . . ."

radio in the last nine years, who now have approximately one-third million authorized transmitters, is a direct result of the utility of instantaneous contact with moving vehicles including cars, trucks, forklift and straddle trucks, tractors, tugs and towboats, overhead and travelling cranes, switch engines and every other conceivable vehicle used for business purposes. The economics of application of two-way radio and statistics of installations support continued high demand for additional spectrum space."

Mobile radio communication is the service which is set up for the handling of messages between any number of mobile units and a fixed station. Generally the operation is confined to a given urban area or an area of somewhat equivalent size in a non-urban region. For this reason, the radio frequencies selected for the mobile radio service are of an order that will permit suitable communication over only a restricted area and not interfere with stations outside the area. These frequencies are to be contrasted with the somewhat lower frequencies used for long distance radio communication and the higher frequencies used for point-to-point relay communication. The latter refers to the microwave frequencies which are used extensively in the operation and maintenance of the long gas transmission pipelines.

Mobile radio has been responsible for many drastic operational changes in the country's gas companies— transmission and distribution alike—over the past 10 years. It was during the early years of the past decade that mobile radio found such wide use in the dispatching of emergency repair crews. It became possible for the first time for nearly all of a company's servicemen to be almost immediately available at all times for emergency calls. The need for emergency standby crews was practically eliminated.

Mobile radio also made field supervisors at all times for the close supervision of men and crews in the field. For instance, before mobile radio came into wide use it was necessary to carefully plan, on a time schedule, for the pressure reduction required for tie-in and repair operations. Now such an operation is all but routine with close and continuous coordination between field crews and the central or district office provided through the medium of mobile radio. This one single example has resulted in considerable saving in time and mileage, and a substantial reduction in the hazards involved.

"It was during the early years of the past decade that mobile radio found such wide use in the dispatching of emergency repair crews."

As the benefits of the use of mobile radio continued to become more and more obvious its use expanded into customer service operations and other, non-emergency functions. Today, even the smaller gas distribution companies use mobile radio for the dispatching of customer service trucks. T. G. Humphreys, of the Alabama Gas Corp., points out the vital role that radio has assumed in gas company operations is no better indicated than by the local gas plant manager who invariably remarks, shortly after radio has been installed in his plant, that "I honestly don't know how we ever operated without it!"

In gas transmission company operations, mobile radio has assumed an equally important role. The gas transmission company needs communication with field vehicles engaged in line maintenance and repair, particularly during emergencies such as a line break in a densely populated area or near a public highway or a river. The ability of the operating personnel to obtain answers to questions and decisions on immediate problems from supervisory personnel, who are not available to fixed communications facilities, is an operating necessity of considerable importance. The coordination of hazardous activities, through central direction of field personnel, results in such increased safety to the personnel and the plant itself that there is no large line in operation today that is not equipped with good mobile radio facilities.

Many pipeline companies operate their own aerial patrol. Communication between the patrol planes and pump stations or repair crews is effected by means of radio, which greatly expedites the reporting and repair of leaks or other conditions requiring immediate attention. Such communications are conducted on mobile frequencies allocated to the Petroleum Radio Service. The patrol planes are also equipped with customary radio facilities operating on aeronautical frequencies.

Pipeline contractors have found that the use of mobile radio has materially added to the efficiency of their operations and to the service they render in constructing and reconditioning pipelines. Because they are not engaged in the transportation of petroleum products or natural gas, they are not eligible for frequencies in the Petroleum Radio Service. Since they are en-

gaged in construction activities, which are carried on in the most part in remote or sparsely settled areas, they are eligible for the use of frequencies within the Special Industrial Radio Service.

It is important to realize that the far-flung activities of a pipeline create communication problems that cannot be handled satisfactorily without supplementing the relatively short range of the mobile equipment with other auxiliary radio communication facilities.

Activities of maintenance crews a hundred miles of more apart must be coordinated for maximum efficiency and safety. For example, in order to cut in a gate valve, safety demands that the line be purged with air inert gas, water, etc., at the point where the work will be done and between the values or stopping equipmnet controlling the gas flow. Thus, the transferring of information among three field operations, all relating to one item of work, is necessary if the safe completion of the work is to be accomplished in the shortest time, and this can be done only with mobile radio and additional communication facilities are essentially the same as those required for communication from point to point along the pipeline.

The technical developments, which have made these operational facilities a possibility have been many. The first and foremost of these is unquestionably the arrival on the scene of frequency modulation. Even during the early years of the last decade there arose the problem of interference between services caused by insufficient frequency spectrum to accommodate everyone that wanted to use mobile radio for one purpose or another. Frequency modulation alleviated this condition to an extent. Wideband frequency modulation, which first replaced audio modulation, was soon replaced by the still more effective narrow-band frequency modulation.

Now that the problem of crowded bands has continued to plague the industry the use of "split channel" methods and the serious consideration of single sideband techniques have come in for widespread investigation. Either of these two systems would permit a greater number of facilities to occupy a given segment of the radio frequency spectrum.

Of more detail importance is the fact that during the past decade receivers have been greatly improved both from the standpoint of sensitivity and selectivity. Also, both transmitters and receivers are more stable. Improvements in component parts have had a marked influence on reducing maintenance costs and problems.

"Facsimile, so long neglected, may soon be recognized as a highly valuable tool in gas utility operations. It is conceivable that facsimile will be used to transmit written orders direct to personnel in trucks and other vehicles along with voice instructions."*

As for the future it takes no crystal ball to see some of the advances in mobile radio that may be expected over the next decade. The problem of overcrowded bands is still one to be reckoned with and it may well be that single sideband is the answer. This technique would permit a given frequency band to accommodate twice as many services as that permitted by use of the current double-sideband technique. It may well be expected that still other techniques and methods will be developed and put to use during the next 10 years that will make for still more efficient use of the radio spectrum available.

With respect to equipment of the future, the development of the transistor, miniaturized components and printed circuitry will make it possible to build a complete two-way radio unit small enough to be carried on the person. Such a unit could plug into a socket on the dashboard of a vehicle for normal vehicular use, or be carried on the operator's person to the work site. When used in the vehicle it would operate from the automotive electrical system and when hand-carried it would use its own, self-contained power source.

Facsimile, so long neglected, may be recognized as a highly valuable tool in gas utility operations. It is conceivable that facsimile will be used to transmit written orders direct to personnel in trucks and other vehicles along with voice instructions. The elimination of error, always troublesome in verbal orders, would be a worthwhile achievement.

It would be possible to continue indefinately in listing the progress that may be expected in the decade ahead—and even then there would be some important achievements ignored. However, it is only necessary to look back over the developments of the past decade to arrive at some idea of the progress that may be expected over the 10 years to come. ■

*The above photo was taken at Chicago during the GAS Facsimile Demonstration, August 3-4, 1955. Left to right are Arthur L. Reese, Motorola; Warren Bulla, Texas Illinois Natural Gas Pipeline Co.; Homer Marrs, Motorola; and Chester E. Upson, Texas Illinois Natural Gas Pipeline Co. See "The GAS Facsimile Demonstration," by Frank Chapman, GAS, September, 1955 p. 107.

Hope case set pattern for a decade of regulation

THE changes in the law of utility regulation and in federal legislation since World War II have been important to the gas industry. A 10-year survey of this development reveals significant trends which can be used to predict the outlook for the future.

The gas industry has grown to be the nation's fourth largest industry, so millions of people comprising consumers, employees, and investors have a huge stake in the related regulatory commission and legislative actions.

Rate making

The impact on regulatory commissions of the United States Supreme Court's decision in the celebrated Hope Natural Gas case has been of major importance in the last 10 years.

The Hope decision was hailed by regulatory commissions as being a declaration of independence from the use of reproduction-cost-new estimates in determining the utility's rate base. The United States Supreme Court ruled in the Hope case that a commission is not bound "to the use of any single formula or combination of formulae in determining rates. Its rate-making function, moreover, involves the making of pragmatic adjustments. . . . It is the result reached, not the method employed, which is controlling."

Some state commissions became too eager in regulating utility rates under the new freedom and announced their results without showing the basic facts required to determine the reasonableness of the results. Several state supreme courts had to admonish the regulatory commissions that it was necessary for them to find a rate base and to reveal that the utility was allowed to earn a fair return on that rate base after being reimbursed through consumer rates for operating expenses, depreciation and taxes.

Since the Hope decision the trend has been toward the adoption by regulatory commissions of original cost less the accrued depreciation as the rate base. Currently only 12 states give some recognition to present fair value in fixing the rate base, and most of these commissions consider the state statutes to require it.

The Supreme Court in the Hope decision overruled a prior decision prescribing fair value as the basis for determining annual depreciation by declaring that annual depreciation should be based on cost, and that "by such a procedure the utility is made whole and the integrity of its investment maintained. No more is required."

In recent years the straight-line method of computing depreciation has become more popular than the sinking-fund method. More recently the concept of remaining service life has gained momentum. The committee on depreciation of the National Association of Railroad and Utilities Commissioners stated in its 1950 report: "The aim of depreciation accounting is to spread the cost of plant, less net salvage to be realized on retirement, as equitably as is practicable over the service life of the plant. This aim is difficult of precise achievement because the factors upon which depreciation charges are based will not be definitely known until the plant has been retired. During the time plant is in service, its average service life, the salvage expected to be realized, and the cost of removal expected to be incurred are necessarily estimates. These estimates are subject to change from time to time as more comprehensive information regarding past experience and probable future conditions become available. Nevertheless, it is not likely that the exact amount of depreciation expense charges required will have been provided unless a procedure is established for reconciliation of the estimates of depreciation accruals with the actualities which develop as the years pass by.

"Such reconciliation can be made by application of the remaining life basis of depreciation accounting. Under this procedure, the cost of plant, less net salvage, and less depreciation already provided for, is spread over the remaining service life of the plant. In other words, the undepreciated cost is to be provided during the remaining period of service of the plant. As plant becomes older, estimates of its total service life and remaining service life become more accurate, and final net salvage may be estimated more closely. Thus, the remaining life basis for all practical purposes assures that the actual cost of depreciation will be charged during the life of plant."

Depreciation involves millions of dollars in the rate-making process and has received the constant attention of the regulatory commissions. The most recent subject has been the accelerated depreciation permitted by Congress. The 1955 report of the NARUC committee on accounts and statistics reaches a significant conclusion, thus, "The committee is convinced that the use of

the liberalized depreciation procedures permitted by the 1954 Revenue Act results in tax reduction, not tax deferral, and that it would be contrary to sound accounting principles and to the provisions of the Uniform Systems of Accounts to record such tax reduction in a deferred credit account.

"The real regulatory problem in connection with tax reduction arising through liberalized depreciation is how to treat the tax reduction in fixing rates for service. . . . The procedure for increasing depreciation charges by an amount equal to the tax reduction occasioned by liberalized depreciation may be especially apt for many utilities. It would be a sound financial practice which would not conflict with accepted accounting principles and is worthy of serious consideration by commissions and utilities."

In the last 10 years regulatory commissions have developed a concept in

rate making upon which they have become adamant. The commissions now make a working cash allowance only after deducting the amount accrued for the payment of taxes, and asserting that such accruals are available to cover the time lag between expenses and related revenues.

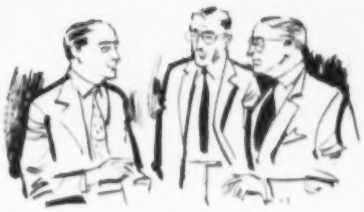
The Hope decision by the Supreme Court, approving a 6½% rate of return for a natural gas company, prescribed the standard of finance required to determine a fair return. The Supreme Court declared that, "The investor interest has a legitimate concern with the financial integrity of the company whose rates are being regulated. From the investor or company point-of-view it is important that there be enough revenue not only for operating expenses, but also for the capital costs of the business. These include service on the debt and dividends on the stock. . . . By that standard the return to the equity owner should be commensurate with returns on investments in other enterprises having corresponding risks. That return, moreover, should be sufficient to assure confidence in the financial integrity of the enterprise, so as to maintain its credit and to attract capital."

Since the Supreme Court's announcement of that standard there has been an emphasis in rate making on the use of the cost of money as the main guide for determining the fair return to be allowed a utility. There is little debate over the cost of money from the sale of bonds and preferred stock. The difference of opinion has arisen from the determination of the cost of common stock equity money. One of the improvements in the rate-making process has been the use of more objective analyses than the former intuition in ascertaining a fair return.

The debt ratio in a utility's capitalization is important in determining the return to be allowed. A number of commissions and courts have passed upon the use of theoretical debt ratios rather than the company's actual capitalization. The general view is that, although management has the right to determine the type of capital structure, it cannot compel consumers to reimburse it for an extravagant capitalization. This approach is used by regulatory commissions when the commissioners consider that the utility should refund its outstanding bonds under market conditions that would result in a saving in the cost of money.

The inflation in the last 10 years has made utility rate-making a difficult task. The unit cost of building utility plants has risen 100% since World War II. Cost of operation, including labor, materials, and the purchase of natural gas, has also jumped. The result has been a shrinkage in the realized rate of return under consumer rates that have not kept pace with this galloping inflation. The regulatory commissions have used several methods of recognizing the inflationary forces through allowances in the level of expenses, the rate of return, a future test year, or the rate base. One commission in trying to compensate for this known attrition has found it necessary to consider the trend of the rate of return when fixing rates designed to yield a fair return in the future. This commission determines what the basic fair return is and then adds an allowance to that to counterbalance the predictable future shrinkage in the basic return that will be realized.

During the last 10 years the volume of rate cases presented to the regulatory commissions created a regulatory lag between the time a utility applied



for a rate relief and the commission's decision authorizing increased rates. The utilities suffered unrecoverable losses while waiting for regulatory relief. Rate making is a time consuming process and so regulatory lag is inevitable, but procedures have been adopted to minimize the financial loss to utilities. One method was to grant temporary rate increases pending the final determination of rates. Another method involving the natural gas companies was to allow contingent retail rate increases to compensate for contingent wholesale rates, pending the Federal Power Commission's determination of final rates. This has been accomplished by individual rate cases, and by the inclusion of automatic rate adjustment clauses in rate schedules to reimburse a retailing company for the higher price it must pay for purchased natural gas. Another method to expedite rate cases was the development of the procedure requiring the mailing of exhibits to all participants in a rate case prior to the hearing date on which that evidence was to be presented. This reduced the number of hearing days by permitting cross-examination of expert opinion testimony to follow immediately after the direct evidence.

Accounting based on original cost

In the past 10 years the Federal Power Commission has been diligent in enforcing its uniform system of accounts prescribed for natural gas companies. Seventy-eight companies have had their gas plant accounts reclassified on an original cost basis. Original cost is defined as the cost of gas plant to the person first devoting it to public service. There are two categories of gas plant: (1) plant constructed by the

Continued on page 58

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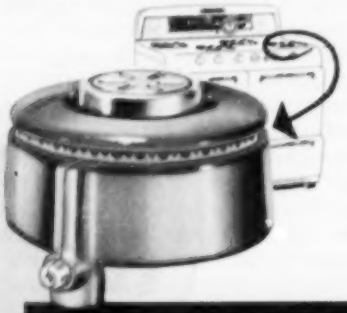

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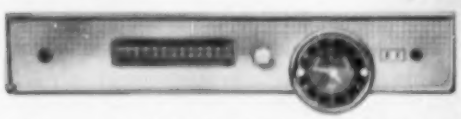

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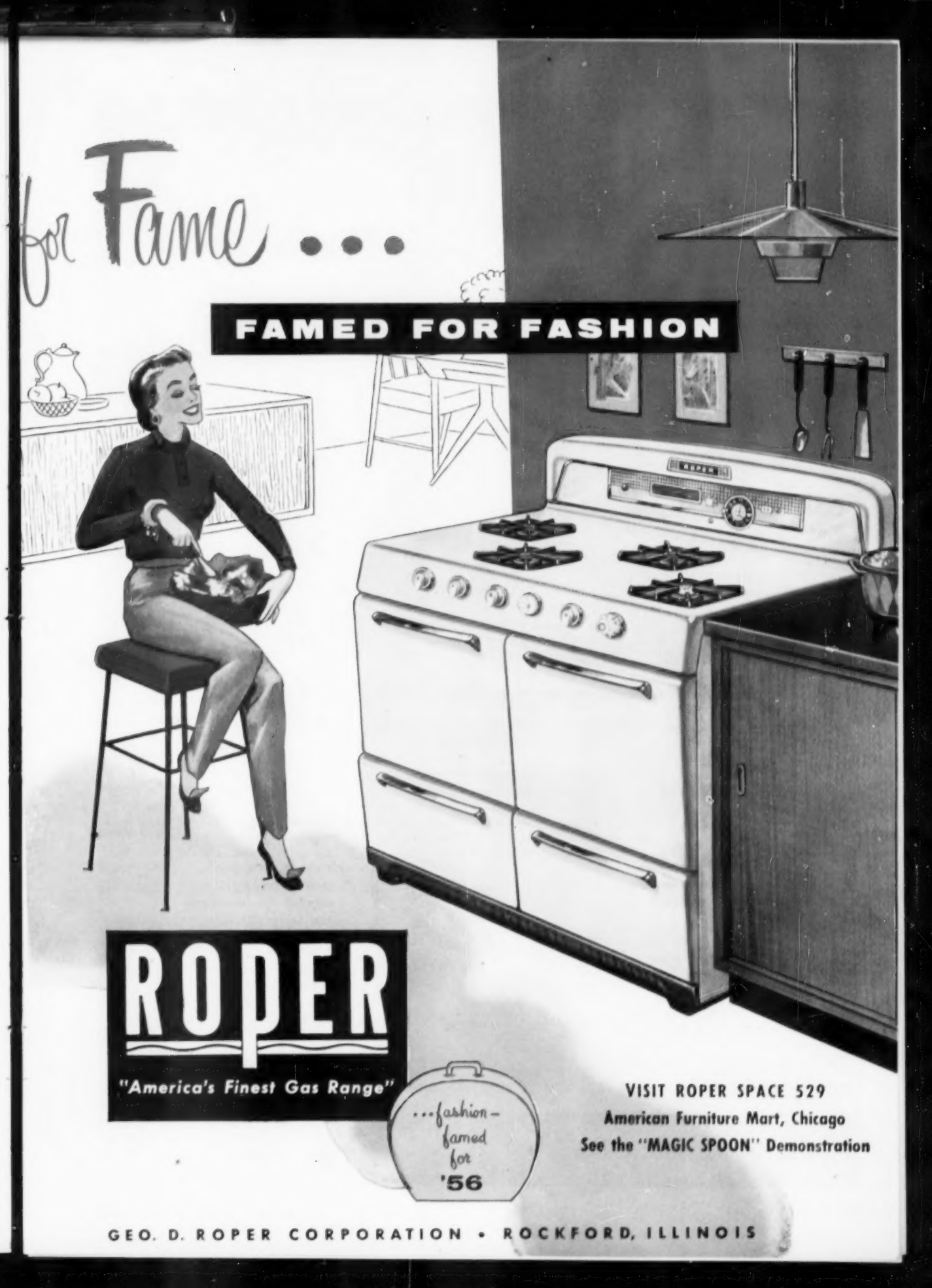
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Continued from page 55

utility, and (2) plant acquired by the utility. The FPC requires a gas company to place in its gas plant acquisition adjustment account (100.5) the difference between the cost to the accounting utility of plant acquired, and the original cost less depreciation. The FPC also requires the inclusion in another gas plant adjustment account (107) the difference between the original cost of property constructed by the accounting utility and the book cost of gas plant at the effective date of its uniform system of accounts. This account was to contain the write-ups of gas plant which had occurred prior to the installation of the FPC system of accounts.

By June 1955 the FPC had issued orders approving the disposition of plant adjustments totaling $220 million; $52 million represented gas plant acquisition adjustments, and $168 million represented gas plant adjustments. The stockholders took a large loss when it became known that the FPC required the gas companies to dispose of $197 million by charging $97 million to capital surplus, $31 million to earned surplus, $62 million to reserves for depreciation, and the remainder to other accounts. $23 million of gas plant acquisition adjustments were made subject to annual amortization.

Financing

Since World War II inflation and expansion have caused the natural gas industry, along with other utilities, to engage in large scale financing. In the post-war period public utilities have raised $32 billion of the total of more than $72 billion of corporate financing in the United States. This represents more than 44% and the gas utilities had their proportionate share of financing.

There has been a tendency by the interstate natural gas pipeline companies to utilize more debt financing than gas distribution companies. The reasoning used has been that the interstate pipeline companies have contracts to purchase natural gas for a period longer than the bonds sold to finance the project, and have take-or-pay-for gas sales contracts for the same period of time. The FPC, however, placed a limitation of 75% debt in the total capitalization of a major interstate pipeline company. Since that time the pipeline company has voluntarily made its capital structure more conservative by reducing its debt ratio to about 65%.

In 1952 the NARUC committee on corporate finance issued an admonition to utilities and to regulatory commissions about the shortcomings when debt is incurred even though it is unnecessary. The committee pointed to the financial failure in the past of many railroads which resulted in a large part from unsound and top-heavy debt financing. The committee observed that the financial failures were ultimately reflected in inadequate maintenance, lack of capital for extensions, and generally impaired service to the extent that service became a much more serious public issue than consumer rates have ever been. The committee gave this warning: "A revival of sound financial practices is imperative, the more so because of the current inflationary trend. Gains which appear to be realized today from low interest rates and tax savings may prove to be illusory. Proper debt ratios should be determined, not on the basis of seem-

Continued on page 60

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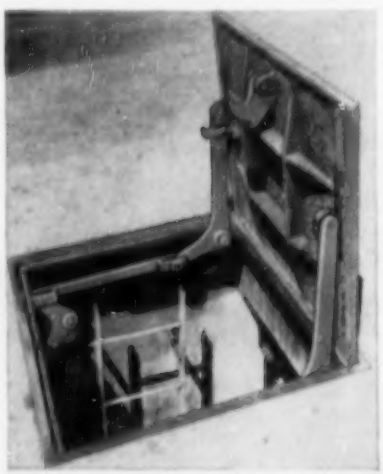

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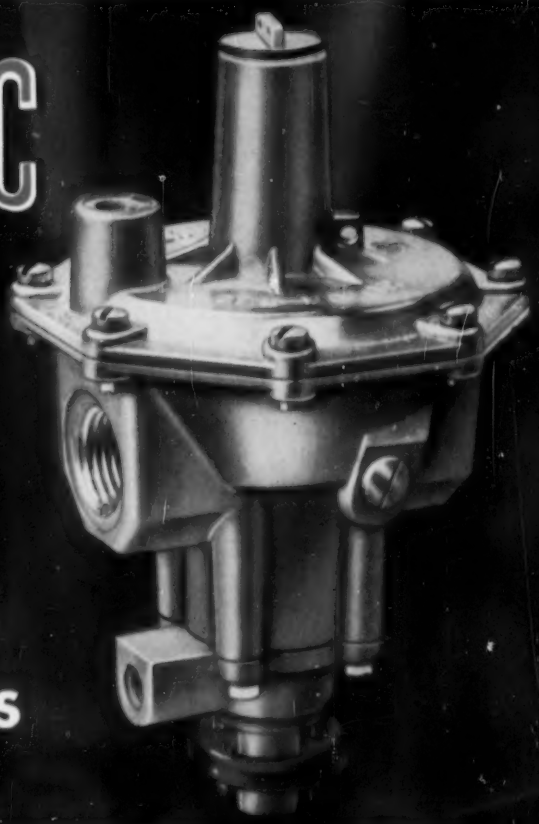

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ing savings, but by careful analyses of the relative risks and volatility, first, of the utilities as a whole compared with other branches of industry; second, of the various types of utilities; and third, of individual companies.

"Good credit, if once lost by a corporation, is seldom regained. At best, loss of prime credit standing results in increases in total capital costs. At worst, it will impair the quality of service and lead to a public reaction much more serious than any reaction against rate increases of the magnitude required to restore the utilities' financial position to the same level as in 1940.

"Today, as in the '20s, a critical appraisal of utility financing practices is called for to insure the financial soundness of these essential institutions in future years. Since the last war there has been a greater spread between the earnings of utilities and industry generally than existed previously and if this spread is to be continued through holding rates down to bare subsistence levels it is highly questionable if the public interest will be served in the long run.

"Similarly a wide gap has developed between general price, wage and income levels and the level of utility rates. The commissions have been industrious in keeping rate increases to modest proportions—perhaps too much so—as is evidenced by many repeats in applications. What might have to be done ratewise in order that the utilities will continue to be able to obtain the new capital needed on reasonable terms will still be far below the increase in general prices. The assurance of the ability to raise capital is, of course, vital to the public interest."

Jurisdiction

During the last 10 years the United States Supreme Court has rendered several decisions involving the jurisdiction of federal and state regulatory commissions over natural gas companies.

In 1949 the Supreme Court ruled that the Federal Power Commission did not have authority to require its prior approval before a natural gas company, subject to the Natural Gas Act, could sell its leases covering gas reserves. The court said Congress did not intend to permit the FPC to control the production and gathering of gas by regulating the ownership of gas reserve properties.

The United States Supreme Court in 1947 declared that the individual states, not the Federal Power Commission, have power to regulate the sales of natural gas made by an interstate pipeline company directly to industrial consumers. The Supreme Court added that the legislative history, and the objects of the Natural Gas Act, show an intention for the states to continue with regulation where Congress has not expressly taken over.

In 1951 the Supreme Court decided a case involving an attempt by an interstate pipeline company to sell gas directly to industrial customers in the same area served by a local gas company, being supplied by the same interstate company. The court announced that the state commission could require the interstate pipeline company to obtain a certificate of public convenience and necessity before selling gas to local industries. The court concluded that: "Thus, not only would there be two utilities using local facilities to accommodate their distribution systems, but they would be seeking to serve the same industrial consumers. Appellant

Continued on page 62

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Continued from page 60

asserts a right to compete for the cream of the volume business without regard to the local public convenience or necessity. Were appellant successful in this venture, it would no doubt be reflected adversely in Consolidated's overall costs of service and its rates to customers whose only source of supply is Consolidated. This clearly presents a situation of 'essentially local' concern and of vital interest to the State of Michigan."

In 1955 the United States Supreme Court interpreted the Natural Gas Act to require a company to exhaust its administrative remedies before the FPC prior to seeking a judicial review. The court decided that before a natural gas company can appeal to the courts it must first apply to the FPC for a rehearing on any order that aggrieves the company. The court also proclaimed that the Natural Gas Act precludes the consideration by the court of any objection to an order of FPC unless that objection was urged before the FPC in the application for rehearing.

In June 1954 the United States Supreme Court ruled that the FPC has the duty to regulate the price charged by an independent producer who sells natural gas that is ultimately transported and resold in interstate commerce. This Phillips decision has created one of the most explosive controversies in the natural gas industry. In the 16 years of administering the Natural Gas Act the FPC had considered independent producers to be exempt from federal regulation. Since the Supreme Court's decision, however, the FPC has conscientiously undertaken to regulate the prices charged and the facilities operated by the 5000 independent producers where interstate commerce occurs.

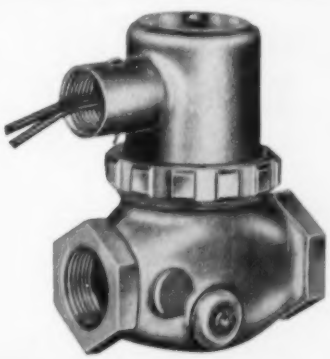
Legislation

The proposed amendment to the Natural Gas Act to overcome the results of the Phillips decision by exempting producers of natural gas from federal regulation as public utilities passed the the House of Representatives in 1955. The Senate will consider the amendment in the 1956 session. The proposed legislation traveled a rough road to the compromise form in which it passed the House. Generally, the large gas producing areas favor the exemption of producers and the big city consumer areas oppose it.

Continued on page 64

"Now take it easy on this job . . . they're not used to noises.
They have a quiet White-Rodgers 'Cushioned Power' Solenoid Valve."

Your customers will never be robbed of their rest and relaxation by annoying gas-valve noise after you install this amazingly quiet White-Rodgers "Cushioned Power" solenoid gas valve. Use it with any type of gas . . . it's easy to install. Available also in "plug-in" pilot and valve combinations.



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PRESSURE FITTING
that conducts electricity

Telsco Long and Short Couplings, Adapters, 90° Elbows, and Tees, ½ through 2 inches.

Use Telsco Fittings on Plastic Pipe, too—Metal Stiffeners for this application are available.

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You can't sell gas that leaks out before it reaches the meter.

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Anchor's Engineering Dept. will design and supervise plant construction.

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Anchor's experienced staff will assist with the financial details..

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Huge tank car fleet, many plants and vast underground storage assure adequate supplies.

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In 1953 Congress amended the mineral leasing laws to remove the common carrier obligation from a natural gas pipeline passing through the public domain if that pipeline's rates were subject to FPC, state or municipal regulatory authority.

In 1947 Congress made an important addition to the Natural Gas Act to facilitate the construction of interstate pipelines. The added provision authorized any pipeline which had a certificate of public convenience and necessity to acquire the necessary rights of way for the pipeline by condemnation proceedings in a federal court.

In 1954 Congress adopted the Hinshaw amendment to the Natural Gas Act to eliminate duplicate state and federal regulation of natural gas companies. This amendment will save hundreds of thousands of dollars of company expense and regulatory commission expense which resulted from dual regulation. Today, although a natural gas company is transporting interstate gas, it is not subject to FPC regulation if it receives the gas at the boundary of the state in which it has all of its facilities and that gas is ultimately consumed within such state and the state regulates rates, service and facilities of the natural gas company. The FPC has exempted 77 natural gas companies from the Act under the Hinshaw amendment.

Outlook

From the survey of trends in public utility law the following predictions can be made. The problems in rate making which have been caused by the 1940-1952 inflation will continue to confront utilities and regulatory commissions for many years. Accelerated depreciation for the purposes of income tax will have to be considered in determining the earnings requirements in future rate cases. Commissions will become more enlightened on what constitutes a fair rate of return for a utility. Original cost of utility plant less accrued depreciation will continue to be the rate base adopted by the majority of commissions. The adoption of purchased gas adjustment clauses to provide for automatic retail rate changes to reflect changes in the wholesale price for gas will gain popularity. Although regulatory commissions have been told by the United States Supreme Court that rate making is the balancing of the interests of consumers and investors, commissions will continue to favor consumers. ■

There's everything you'd expect of a
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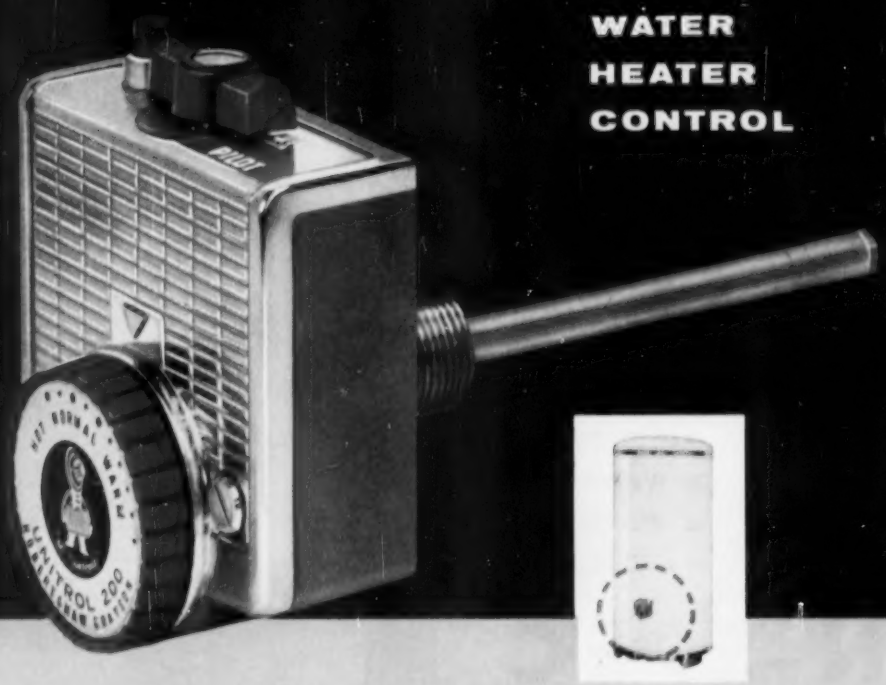
NEW UNITROL® 200

WATER HEATER CONTROL



UNITROL 200 features include dust-proof filter; air-gap construction; gas valve body of special aluminum alloy to resist gas corrosion; immersion parts of red brass and copper to resist water corrosion.

Ask your water heater manufacturer for full details or write:

EYE-APPEAL that gives water heaters added sales appeal

STYLING that permits concealed or flush-on installation

COLOR that harmonizes with metal trim and available in several finishes

EASE OF SERVICING that's as simple as one-two-three without breaking connections

FINEST PERFORMANCE that's traditional with UNITROL Water Heater Controls

Robertshaw-Fulton
CONTROLS COMPANY

Grayson Controls Division, Long Beach, California
Robertshaw-Fulton Controls (Canada) Ltd., Toronto

GAS associations——

Effect of electronics on utilities discussed

The potential effect of electronic machines on various phases of public utility operation drew 157 delegates to the fall conference on electronic data processing for public utilities, jointly sponsored by the Pacific Coast Gas Association and the Pacific Coast Electrical Association.

Designed as a logical follow-up to last February's seminar, which was planned to acquaint top management with benefits to be gained from electronic applications, the fall conference was beamed toward the department-head level, to point out the integration necessary before economies inherent in high speed electronic devices can be realized.

Two outstanding authorities in the field of electronic data processing spoke at the general luncheon sessions. Richard D. Dotts, assistant vice president of Pacific Mutual Life Insurance Co., spoke from his experience in installing a Univac in Los Angeles when he presented "A Case Study of the Installation of an Electronic Data Processing System." Everett S. Calhoun, manager of electronic data processing research at Stanford Research Institute, counseled the group on "Preparing for the Challenge of Electronics."

Five sessions runnning concurrently through the two-day conference were held on integration of customer accounting and collecting activities in preparation for electronics; responsibility or cost accounting with electronic machines; payroll plans for processing with electronic machines; the auditor's place in electronic accounting; and building design and maintenance for electronic and mechanical equipment.

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Gas or water line leaks due to corrosion are expensive profit eaters in both repair time and replacement costs. An-Spec magnesium anodes protect your underground or submerged metal structures from industries most costly enemy—CORROSION. Call us for high quality magnesium anodes . . . experienced installation crews . . . competent engineering . . .
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Broad fields to be covered at management conference

Subjects ranging from "Economic Analysis and Forecast" to "Canadian Gas Resources" will highlight the second annual general management conference of the AGA at the Conrad Hilton hotel, Chicago, April 4-6.

In addition, a competent speaker will discuss cost problems in business; Dean H. Mitchell, AGA president, will give an address; and organization planning and labor-management relations will be under discussion.

The conference will include general sessions in the mornings, section luncheons, and combined sessions concurrent with individual committee open business meetings on the first two afternoons.

A combined insurance-personnel session will include a presentation by a General Electric representative on his company's recently negotiated comprehensive health plan.

Instrument short course set for this month

The fifth annual Instrument Short Course will be held Jan. 24 and 27 at the Los Angeles Harbor Junior College, Wilmington, Calif.

This course, co-sponsored by the Southern California Meter Association and the junior college, covers all phases of instrumentation and serves as a refresher course for engineers on basic instrument principles as well as an opportunity to keep pace with the rapidly advancing technology in the field of instrumentation and automation.

Along with the technical papers section, there is a practical methods sec-

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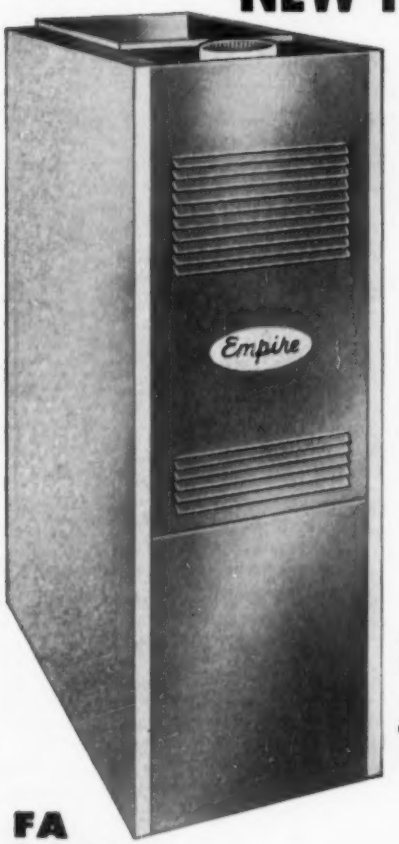
WITH EMPIRE AIR CONDITIONERS

THE ANSWER TO *LOW COST* WINTER AIR CONDITIONING!

It's designed to give you *LOW COST* heat...

NEW HOMES OR WHEN REMODELING OLD HOMES



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Far ahead of other makes the FA unit is new and exciting.

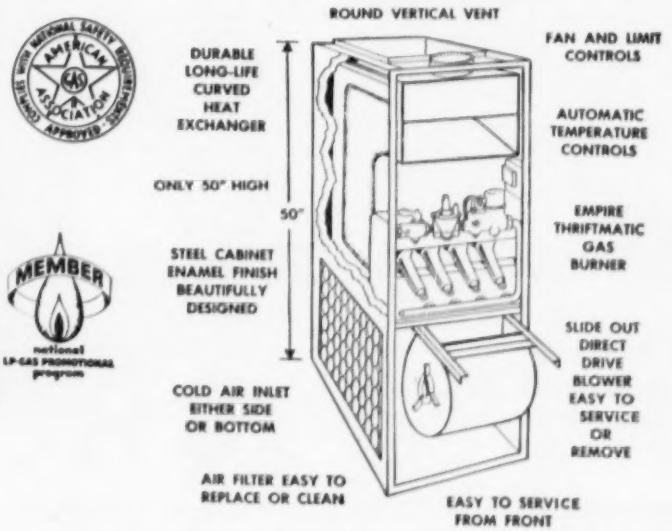
Well designed and expertly engineered for the home where low cost is important.

Millions of American homes can now enjoy comfortable low cost automatic gas heat *at a fraction of the former initial cost.*

Efficient, Too! Provides all the service and comfort of units twice the size and cost.

EASY TO INSTALL • FIT IN SMALL SPACE

NO EXTRA COST!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DURABLE LONG-LIFE CURVED HEAT EXCHANGER
ONLY 50" HIGH
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STEEL CABINET ENAMEL FINISH BEAUTIFULLY DESIGNED
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AIR FILTER EASY TO REPLACE OR CLEAN
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FAN AND LIMIT CONTROLS
AUTOMATIC TEMPERATURE CONTROLS
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MEMBER national LP-GAS PROMOTIONAL program

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STOVE COMPANY

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Take a close look at the engineering and construction features of the Lancaster Groove Type Metal Rim Diaphragm and you'll see why it assures greater over-all accuracy and more years of service in the meter.

New—BETTER SEALING

Now Lancaster offers better sealing with the new Lancaster Buna-N-Cork Meter Gaskets. Here's the answer to that occasional gasket leakage. Send for a sample today and test it in your shop.

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associations • *Continued*

tion, which is designed to train technicians in the maintenance, calibration and application of instruments and control devices.

A third phase of the short course is an exhibit put on by instrument and control manufacturers.

Committeemen named for measurement short course

The general committee of the Southwestern Gas Measurement Short Course has announced that the 31st annual short course will be held at the College of Engineering, University of Oklahoma, Norman, Okla., on April 17-19.

According to Roland O. Cox, Lone Star Gas Co., chairman of the general committee, the executive committee of the course has appointed the following to serve as chairman of the subcommittees indicated: Roy S. Peace Jr., Southern Natural Gas Co., program; R. R. McCafferty, Pioneer Natural Gas Co., publications; D. H. Lindsey, Northern Natural Gas Co., practical methods and registration; Vars W. Bates, Southern Union Gas Co., exhibits; Miss Kate A. Niblack, Oklahoma Utilities Association, publicity; Dean W. H. Carson, College of Engineernig, University of Oklahoma, local arrangements; and E. L. Stark, Foxboro Co., exhibitors.

GAS association notes

William H. Dalton has been appointed general manager and a director of the Canadian Gas Association. He will headquarter in Toronto. As general manager, Mr. Dalton will devote much of his time to traveling across the country conferring with association members about problems confronting Canada's $500 million gas industry.

Arrangements are being made for another annual seminar on electronic accounting machine developments to be held in Philadelphia on Nov. 28-30. Since the signing of the contract between the AGA, EEI, and Harvard University, considerable progress has been made on the research project for the development of electronic equipment and procedures for gas and electric utilities.

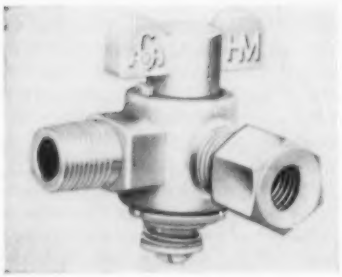
GAMA has elected three new members to its ranks. They are Hook Manufacturing Co. Inc., McDonald, Pa., manufacturer of cast iron gas boilers; Delta Heating Corp., Trenton, N. J., maker of forced warm air furnaces; and Anderson Brass Co., Detroit, maker of gas valves and fittings.

Gas Digest

A digest of what's new in products and trade literature compiled by the editors of GAS as a reader service.

New Products and Trade Literature

For more data on any of these items use the coupon on the bottom of next page . . .



1 Pilot Valve

Helping to round out Thermac's line of gas controls is a new pilot valve consisting of a brass body and aluminum plug. It is available with or without throttle adjustment.

AGA-approved, the pilot valve is made in four principal models with connections for ⅛-in. NPT by ¼-in. compression and with 3/16-in. gasway connections in various combinations.

Thermac Co.

■

2 Backfiller

A new and wider version of Cleveland Trencher's backfiller, known as the Model 80W, has replaced the original Model 80. Although the new unit weighs 11,500 lb, approximately 1500 lb more than the original, its ground-bearing pressure has been reduced from 7.2 to 4.5 psi. This unusually low ground-bearing pressure was achieved by increasing the machine's overall width to 6 ft 3 in. and equipping it with 16-in. wide cralwer pads instead of the 10-in. pads formerly used. Model 80W has a side-crane capacity of 25,000 ft-lb.

The new model, as well as Cleveland's complete line of trenchers and backfillers, is described in a new four-page bulletin.

Cleveland Trencher Co.

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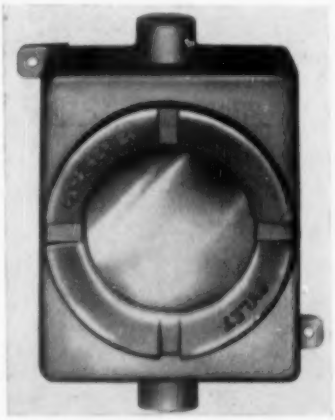

3 Instrument enclosures

A new series of instrument enclosures for hazardous locations has been announced by Pyle-National Co. The new enclosures, which are fitted with threaded covers and heavy glass windows, are convenient for the housing of meters, gauges and other similar equipment that must be read frequently.

The Pylets, as they are known, are explosion-proof, dust-tight and rain-tight. They are furnished in four body sizes with ¾-in. hubs for rigid conduit in both dead-end and feed-through types.

The enclosures would find use in any gas installation where explosion-proof equipment is required or recommended.

Pyle-National Co.

■

4 Meter swivel

A new insulated meter swivel made of DuPont Zytel nylon has been announced by Central Plastics Co. The insulating material is molded directly to the swivel and offers high resistance to impact and flexural fatigue. It is constructed to eliminate failure caused by use of a "blind disk" shutoff.

The insulator may be used with standard gasket and ring, and provides suitable isolation from external cathodic protection currents.

Central Plastics Co.

■

5 Safety water heaters

Three important control factors are embodied in General Controls' new Dual-Safe system for gas-fired water heaters:

The high-temperature limit switch

For additional information use Readers' Service Card pages 73-74

prevents overheating; the thermostat control automatically determines the water temperature and provides 100% shutoff if tank overheats or pilot flame fails; and a 250-millivolt generator holds the pilot safety valve open with power generated from the heat of pilot flame.

General Controls Co.

■

6 Water air conditioner

A new, more compact counter-flow-type winter air conditioner, specifically designed for gas firing, is in production by the Air Conditioning division of American Radiator & Standard Sanitary Corp.

Ready for immediate delivery, the unit is available in 75,000, 100,000, and 125,000 Btu/hr input ratings. It is AGA-approved for 1-in. clearance installation at sides, zero clearance at rear. It can be safely operated on combustible flooring if optional sub-base is used.

American Radiator & Standard Sanitary Corp.

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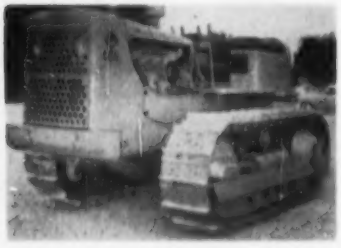


7 Diesel-powered units

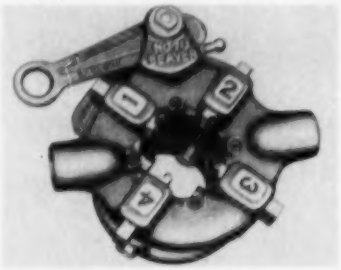
Two new diesel-powered units from Allis-Chalmers—the 12,400-lb HD-6 crawler tractor and the 19,600-lb HD-6G tractor shovel—feature the new A-C diesel engine with follow-through combustion.

In addition, both units have the Wrap-Around radiator guard; all-steel box-type A main frame; one-piece line-bored steering clutch and final drive housing; straddle-mounted double reduction final drive gears mounted on tapered roller bearings; roller bearing truck wheels with 1000-hr lubrication; and Tru-Dimension tracks designed for long life and maximum toughness.

Heart of the units is the A-C HD-344 diesel engine, a four-cylinder, four-cycle unit developing 56 net flywheel hp, 45 hp at drawbar and 55 hp at the belt.

Allis-Chalmers Manufacturing Co.

■



8 Pipe threader

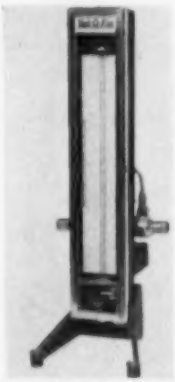
A new pipe threader that threads 1-, 1¼-, 1½-, and 2-in. pipe with only one set of full-width high speed dies is offered in Beaver Pipe Tools new quick-opening Quadra-type threader for use with any power drive.

There is no lead screw to jam or reset. The user is able to set and reset dies instantly. A new guide design gives instant and perfect alignment without clamping to work. The new Beaver 78 has quick-opening throw-out. When the throw-out is opened, the dies retract. There is no need to back off over finished threads.

Beaver Pipe Tools Inc.

■

9 Gas flowmeter



National Instruments' new gas flowmeter linearly indicates directly in volumetric flow units. The assembly comprises a rigid all-metal linear flow element coupled to a manometer. The flow element is made up of a set of flow channels in which streamline flow has been established so that the different pressure produced is proportional to volumetric flow.

The unit may be used to meter flow at pressures from 1 in. Hg absolute to 2000 psig with full scale flow ranges from 0.003 cfm for most of the common gases.

National Instruments Laboratories

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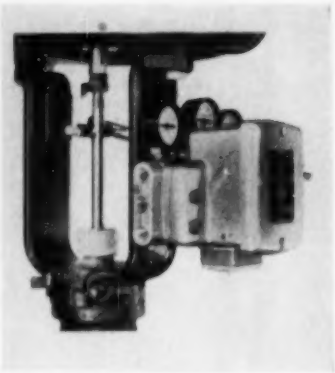


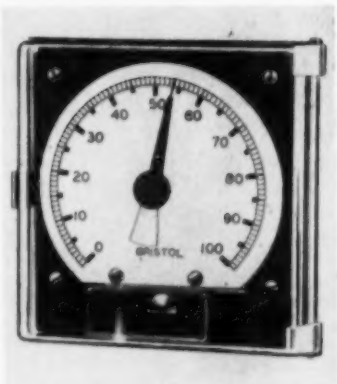
10 Valve positioner

Designed for precise control action, Foxboro's new and highly accurate valve positioner overcomes friction and reduces line effects, speeding valve response to controller signal. Applications of the Type C Vernier Valvacator include large-volume diaphragm motors and processes where controller-to-valve distances are long.

At the turn of a disc, the positioner can be adapted to either air-to-lift or air-to-lower diaphragm motor. A three-gauge and bypass manifold facilitates start-up and maintenance procedures.

Foxboro Co.

■



11 Telemeter receiver

Miniaturized Metameter telemeter receivers, which can be used in graphic panel arrangements, are available from Bristol as either indicators or strip-chart recorders and occupy a panel space of only 5 sq. in.

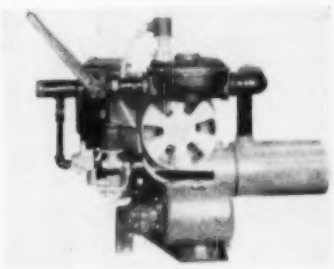
Designed to fit into the company's

For additional information use Readers' Service Card pages 73 - 74

Metagraphic instrument line, the indicators and recorders can be used to receive telemetered signals of any of the usual variables, such as pressures, flows, temperature, differential pressure, and such electrical measurements as voltage, current, and power.

Bristol Co.

■



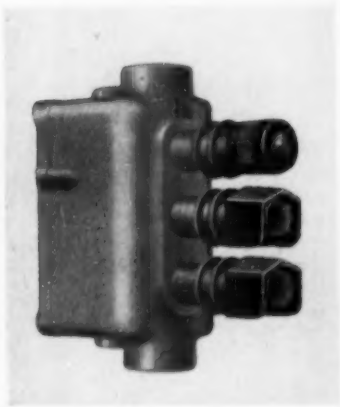
12 Gas/oil burners

Six new gas and gas/oil burners available from Cleaver-Brooks Co. range in size from 720,000 to 8.6 million Btu. They can be used for gas alone; for light No. 2 oil and gas; and a combination of heavy oil (No. 5 grade) and gas.

All secondary air is furnished by the burner. Oil and gas interchange is accomplished instantaneously by the flip of a switch. Air is controlled through the damper modulating between high and low fire.

Cleaver-Brooks Co.

■



13 Dust-tight condulets

For compact flush panel mounting in hazardous locations, a new line of explosion-proof, dust-tight Condulets has been introduced by Crouse-Hinds.

Ideal for flow chart panels, Type EMP Condulets combine explosion-proof construction with absolute minimum panel space requirements. This line of Condulets is furnished with standard pushbutton and selector switch marking plates.

Crouse-Hinds Co.

■

14 Oven-broiler units

Oven-broiler units in white porcelain, stainless steel or Coppertone finish and counter-top units in companion finishes make up a new line of Hardwick built-in gas cooking units.

For simple installation, all gas and electric connections are in front, as are mounting screws, which clamp the oven tightly against the wall. Hardwick's Cold-Air pump helps insulate oven walls and cools vented air.

Counter-top and oven burners employ a Pin-Point pilot. The new Thermal Eye knob controls burner heat accurately for any type of cooking. Clock-control of the oven and Thermal Eye on counter-top units are optional.

Hardwick Stove Co.

■

15 Precision control

What is claimed to be an entirely new design and achievement in precision controls for pneumatic loading and gauging applications is incorporated in the Governaire, a new pneumatic regulator.

Eight Governaire precision control devices are in production. Types include pressure regulators, volume boosters, and reversing relays. The series is specially suited to such machine applications as welding head pressure control, punch press brake and clutch control, cable and sheet tensioning devices, etc.

Bellofram Corp.

16 Gate valve

Grove Seal-"O"-Ring gate valves up to 36-in. for all gas and petroleum pipeline pressures have been made available through the development of an exclusive new fabricated steel body design, according to an announcement of Grove Valve & Regulator Co.

Full opening or venturi types are available with flanged or welding ends. The Grove through-conduit fabricated valve body is also said to provide maximum design flexibility for special applications. Standard models are listed from 2-in. to 36-in. sizes in ASA Series 150, 300, 400 and 600.

Utilizing a parallel-sided port plate with self-aligning metal seats backed up by "O" ring seals, the units are said to maintain absolute bubble-tight seal on both upstream and downstream seats. The body may be vented or drained to provide positive indication of absolute shutoff.

Grove Valve & Regulator Co.

■

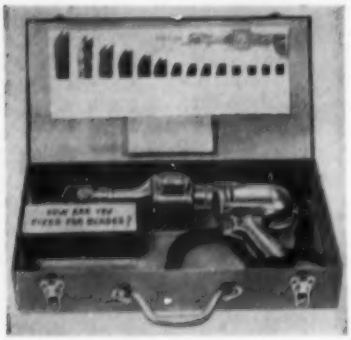
17 Storage water heater

A new under-the-counter automatic storage gas water heater has been designed by Ruud to provide large quantities of hot water up to 180° F from an installation where headroom is limited.

Carrying AGA approval as a free-standing automatic storage gas water heater and as a circulating tank heater, the Sanismaster MS 20-50 has a 16-gal. storage tank of solid Monel, assuring rust-free water and maximum life. The water heater is recommended for use

For additional information use Readers' Service Card pages 73 - 74

in gas stations, barber and beauty shops, in commercial coffee making, and with commercial dishwashing machines.
Ruud Manufacturing Co.



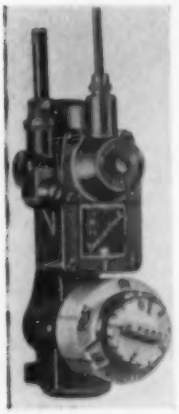
18 Electric hack saw

A new heavy-duty, self-powered, portable electric hack saw has been designed for making straight, circular and random cuts in practically any material, including stainless steel, tempered aluminum, transite and mild steel. According to the manufacturer, Key Hak division, the saw is especially useful for maintenance and emergency work.

Its compact size permits it to be used in close quarters. The forward positioning of the pistol grip handle provides for balance, maneuverability, and affords complete control when making cuts in any direction.
Key-Hak Division

■

19 Incinerator control



An automatic control device for the home incinerator has been developed by Robertshaw - Fulton Controls Co.

The Incinitrol is an all-in-one safety pilot, gas cock, and automatic timing mechanism. The safety pilot, which automatically shuts off the gas supply in case the flame is extinguished, is equipped with a specially constructed, 3-ft internal filter.

Once the incinerator is installed and the pilot lighted, users need only select the length of time for the burning period. The appliance will start automatically and shut off by itself.
Robertshaw-Fulton Controls Co.

■

20 Digging tools

Ingersoll-Rand's new line of paving breaker, demolition, and digging tools is suitable for use in any plant handling such hazardous liquids as gasoline, naphtha, benzine, lacquers, etc., or flammable gases or dusts which could be ignited by spark.

The tools are forged from a beryllium copper alloy, known for its spark-resisting properties.
Ingersoll-Rand Co.

TRADE LITERATURE

21 Power positioner data

Hagan Corp.'s complete line of pneumatic power positioners to provide "muscles" for exacting control loads, is described in a packet of specification sheets. The file folder, Bulletin TP-MFI, describes performance and construction specifications of the positioners, which are used to control flow, pressure, temperature, or level by operating valves, gates or dampers.
Hagan Corp.

■

22 Trencher bulletin

Design improvements on the new Everett trencher, which has been specifically designed for use on the new Massey-Harris Ferguson 35 tractors or the new Series 600 and 800 Ford tractors, are stressed in a new bulletin from Earth Equipment Corp. The profusely illustrated, four-page publication describes in detail the engineering features of the Everett trencher.
Earth Equipment Corp.

■

23 Piston packing data

Information required by engineers and men responsible for the performance and maintenance of equipment and machinery is contained in a comprehensive 16-page data bulletin on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders, and reciprocating pumps. Data Bulletin 5503 from Darling Valve contains operating diagrams and a list of typical installations.
Darling Valve & Manufacturing Co.

■

24 Plug valve booklet

Lubricated plug valves are described in the latest bulletin from Ohio Injector Co. Specifications, service recommendations, and functions of the firm's newly designed lubricated plug valves are included.
Ohio Injector Co.

■

25 Tape-coating data file

A tape-coating data file providing complete information on Plicoflex polyvinyl chloride tape coatings for pipeline corrosion protection is announced by Plicoflex Inc. Technical data includes general properties of the coatings, approximate pipe coverage requirements, and application instructions.
Plicoflex Inc.

■

26 Burner nozzle bulletin

Eclipse Fuel Engineering Co. has published Bulletin H-15 describing open blast burner nozzles for air/gas mixtures. Complete dimension information as well as operating data and installation instructions for the burner nozzles is contained in the bulletin.
Eclipse Fuel Engineering Co.

■

27 Lubrication bulletin

"Studies in Centralized Lubrication 1955" presents case studies that indicate the experience of typical users of Farval centralized lubrication. It is claimed that the lubrication system pays for itself soon in savings—savings in labor, lubricant, bearing expense, and production time.
Farval Corp.

■

28 Polyvinyl chloride booklet

Industrial applications of unplasticized polyvinyl chloride (PVC) and complete specifications for threaded and socket types of PVC fittings and flanges in both normal and high impact grades are the subject of a new booklet issued by Tube Turns Plastics. Installation information, pressure-temperature charts, chemical resistance

For additional information use Readers' Service Card pages 73 - 74

FOR MORE INFORMATION...
on New Products and Trade Literature

...use these SPECIALIZED READER SERVICE CARDS

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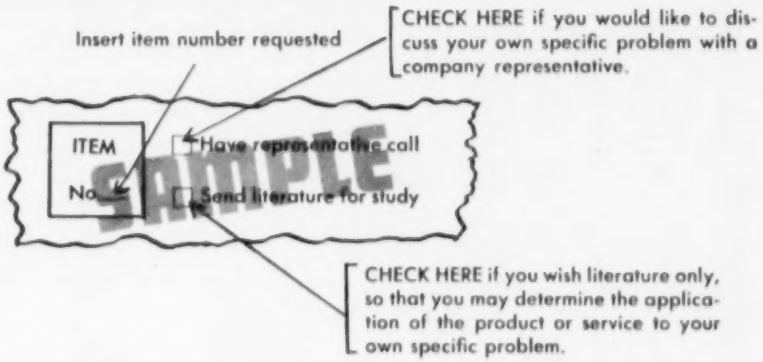
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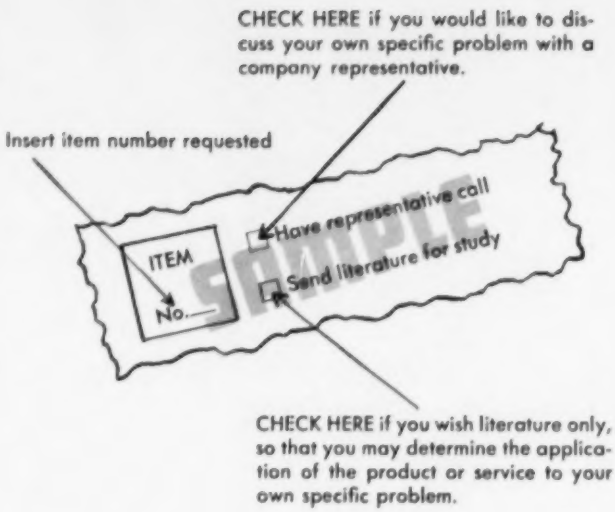
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GAS **magazine**

READER SERVICE DEPT.

198 SOUTH ALVARADO ST.

LOS ANGELES 57, CALIF.

tables and other reference data are included.
Tube Turns Plastics Inc.

■

29 New-facilities brochure

Mercury Piping Co. has published a new-facilities brochure that pictorially illustrates the company's operations in the fabrication and erection of low and high pressure piping. The bulletin illustrates installations ranging from pneumatic control panel systems to large hydraulic presses.
Mercury Piping Co.

■

30 Products handbook

Insulations and refractory products, Transite asbestos-cement pipe, packings and gaskets, electrical products, Celite Diatomite filter aids and mineral fillers, Celite Diatomite catalyst carriers and metal Raschig rings, J-M synthetic silicates, friction materials, pipe protection materials, etc., are some of the lines described in the "Johns-Manville Products Handbook." In addition to product descriptions and engineering data, the handbook also contains a great deal of valuable related information.
Johns-Manville

■

31 Plastic pipe booklet

National Tube has issued a 28-page bulletin (No. 24) describing the physical properties, applications, and installation procedures on its USS National polyvinyl chloride pipe. National Tube extrudes unplasticized rigid polyvinyl chloride pipe of two types—normal impact and high impact. Tables comparing chemical resistance of polyvinyl chloride and other piping materials are included.
National Tube Div., U. S. Steel

■

32 Pipe-threading film

"Portable Parade," a sound movie film, deals with the proper selection and use of portable pipe-threading machines, both in the shop and out on the job. Produced by Oster Manufacturing Co., the film is available to those interested in modern, portable equipment for threading pipe or rods.
Oster Manufacturing Co.

33 Plastic pipe data

Two new bulletins have been released by Alpha Plastics detailing applications, sizes, properties, and fittings of Alpha PVC corrosion-resistant pipe. Two types are described and tables show results of field tests. A companion folder describes and illustrates threaded and socket solvent cement fittings.
Alpha Plastics Inc.

■

34 Mechanical tubing data

The Tubular Products division of Babcock & Wilcox has issued Bulletin TB-360 to acquaint the design engineer with the advantages to be gained by utilizing mechanical tubing. The bulletin should be of interest to product engineers and others who require a knowledge of alloy mechanical tubing.
Babcock & Wilcox Co.

■

35 Thermocouple catalog

Thermocouple temperature-millivolt equivalents are presented in a new Wheelco bulletin, "Standard Conversion Tables" (F7255). Temperatures are expressed on the International Temperature Scale of 1948. Instrument men should find this publication a convenient reference material.
Barber-Colman Co.

■

36 Dryer specifications

AGA-approved specification sheets on the Bendix gas Duomatic, Model CFV; Bendix standard gas dryer, DFF-NA; and Bendix Super-Fast gas dryer, DFF-D, have been made available by the Bendix Home Appliance division of Avco Manufacturing Corp.
Bendix Home Appliance Div.

■

37 Controls catalog

Many new controls, plus late improvements and changes in its complete line of air conditioning and refrigeration controls are cataloged for the first time in a new General Controls publication. Also included are the locations of the company's plants, warehouses, and branch offices.
General Controls Co.

■

38 Enamel service manual

Twenty-seven steps of procedure on the proper use and application of pipeline enamels and primers are detailed in a new Plico service manual. Purpose of the manual is to provide the customer, the contractor, and the pipeline operator with a guide to procedures for the proper cleaning, priming, and coating of line pipe with hot applied asphaltic pipe enamels.
Plico Inc.

■

39 Corrosion brochure

The corrosive effect caused by the galvanic action of metals in contact with earth or water, and the principles used by the Harco Corp. to halt already existent corrosive action or to keep new installations free of significant corrosion damage, are covered in a new technical brochure. The 12-page illustrated bulletin is entitled "Cathodic Protection Systems for Corrosion Control."
Harco Corp.

■

40 Record bulletin

Two new bulletins are available from Remington Rand. (1) Booklet CH-1031 tells how the Southern California Gas Co. has protected itself against loss through the use of a Film-A-Record camera, which films each month's bills and punched cards. (2) Kardex visible records form the heart of a system for handling customer service, truck routing, and invoice accountings, described in Folder X1306A.
Remington Rand

■

41 Steam condenser catalog

Disc-flow type and ejector-flow type barometric steam condensers are described in a new bulletin (Form 9012-A) from Ingersoll-Rand. The disc-flow design is suitable for any barometric steam condenser application, while the Ejectro-Jet type is a simplified design suitable for use where the quantity of non-condensables is moderate and relatively clean cooling water is available.
Ingersoll-Rand Co.

■

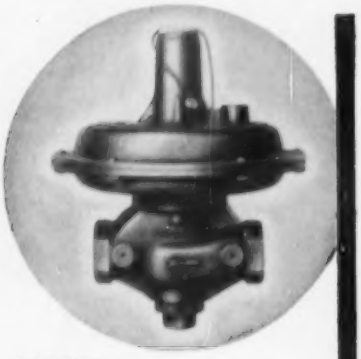
42 Temperature control data

Burling Instrument Co.'s complete line of differential expansion temperature controls for controlling temperatures or for high-temperature safety alarms and cut-outs is described in a new condensed catalog, G-20. Pictures of all the current types, descriptions of their operation, and general specifications are presented.
Burling Instrument Co.

For additional information use Readers' Service Card pages 73 - 74

Steady

REYNOLDS LOW PRESSURE REGULATORS



PIPE SIZES:
¼" to 8"
¼" to 3" with screw connections
3" to 8" with flange connections

Reynolds Low Pressure Regulators guarantee steady, constant, unvarying outlet pressure even though the volume varies and inlet pressure fluctuates. Precision built and delicately balanced for accurate performance on low pressure installations, the units illustrated are backed by factory tests over a wide range of operating conditions. Reynolds Low Pressure Regulators are economical and safe. Our Engineering Department is at your service.

REPRESENTATIVES:

H. D. "Mike" Meuffels
423 Dwight Building
Kansas City, Missouri

Seidenglanz & Co.
2nd Unit, Santa Fe Building
Dallas, Texas

Eastern Appliance Company
281 Vassar Street
Cambridge, Massachusetts

Waldo S. Hull
258 Lee Circle
Bryn Mawr, Pennsylvania

GAS CONTROL Since 1892

Reynolds Gas Regulator Co.
ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

WANTED: Engineering Writer

We need a technically trained man under 35 for the editorial staff of GAS. He should have a background of mechanical engineering and experience in LPG or Gas Operations — with emphasis on equipment. He should be able to write clearly and cleanly and have done some work in preparing reports. He should have an inquisitive mind and like to probe into the "Why" of things, and be able to explain to others what he has found out.

Experience in magazine or newspaper production as well as photography is desirable, but not essential.

Duties will include field trips to gather data for original articles.

Application by letter only. Send details to:

GAS

198 SO. ALVARADO STREET • LOS ANGELES 57, CALIFORNIA

GAS news

Dearborn makes move to expand in Northeast

Dearborn Stove Co., Dallas manufacturer of gas space heaters, plans a big expansion of its distribution in the northeastern section of the country. The program includes the selection of key distributors in carefully chosen distribution centers of New York state, metropolitan New York City, New Jersey, Pennsylvania, Virginia, West Virginia, Delaware, Maryland, and the eastern half of Ohio.

Dearborn Vice President Kleinmann said that since gas has become more plentiful his company feels that there "is an excellent opportunity for a satisfactory volume of sales in the area."

In addition to complete lines of vented and unvented gas space heaters, other Dearborn products to be marketed include water heaters, wall furnaces, evaporative coolers, and the Hobo-Chef portable barbeque.

Unclaimed gas refunds ruled property of state

Unclaimed gas refunds totaling $700,000 will go to the state of Michigan rather than the U. S. Treasury,

John B. Barker, Northern Illinois Gas Co. engineer, adjusts safety belt installed in one of utility's automobiles as part of a company-wide project which is now underway. Both the driver and companion seats will be equipped with safety belts.

Presenting **the New**

CRISE

Solenoid Gas Valve

Higher Capacity

The Crise Solenoid Gas Valve has been designed to combine performance, ruggedness and simplicity for long, trouble-free service on all types of gas fired heating equipment. A soft seat is accurately centered by an improved design to assure positive shut-off and quiet operation. Corrosion-resistant parts make the Crise SV 100 and SV 110 suitable for use with all types of gases. Available in ½" and ¾" sizes, 24 V or 115 V and with or without a manual opener. Write for bulletin.

A Host of Features

- **High Capacity**
- **Soft Seat Construction**
- **Quiet Operation**
- **Streamlined Design**
- **Positive Shut-off**
- **Corrosion Resistant**
- **Suitable For All Gases**

CRISE CONTROLS DIVISION

ACRO MANUFACTURING COMPANY

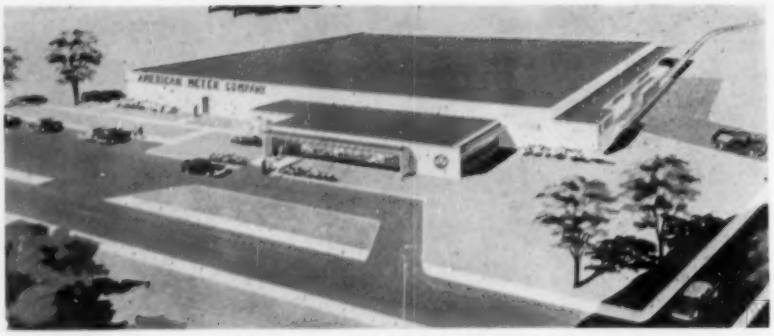
COLUMBUS 16, OHIO

Distributed in Canada by Leland Electric Canada, Ltd., Guelph, Ontario

according to a recent ruling of the 5th U. S. circuit court of appeals, which claimed that Michigan's "escheats" law takes precedence over Treasury department rights to custody of the unclaimed refunds.

The money resulted from a 1952 rate cut for Panhandle Eastern Pipe Line.

The presiding judge's decision was based on the 10th Amendment to the United States Constitution, which reserves to the states the rights of property succession which are not expressly delegated to the federal government.



Artist's conception of American Meter's recently completed plant at Fullerton, Calif. The new suburban location provides for future expansion of production facilities.

ACT NOW!

HANDLE DANGEROUS CLEANING PROBLEMS IN COMPLETE SAFETY WITH A . . .

Doyle EXPLOSION PROOF VACUUM CLEANER

DOYLE VACUUM CLEANER COMPANY
240 Stevens Street, S.W., Grand Rapids, Michigan

Please send, without cost or obligation, detailed information and specifications on the Doyle EXPLOSION PROOF Vacuum Cleaner!

NAME ..... TITLE .....

FIRM ..... STREET .....

CITY ..... ZONE ..... STATE .....

Daily cleaning of hazardous locations can be just a routine operation with the Doyle Explosion Proof Vacuum Cleaner. Cleans walls, floors, bins, beams, pipes or ceiling in critical areas where an ordinary vacuum could not be used.

The unit safely recovers liquids as well as dry materials in areas containing highly explosive or inflammable dust and gases. Underwriter's Laboratories approved, (see U.L. listings) the entire unit is static conductive, constructed and designed to eliminate any exposed sparking which may occur in normal operation.

Make a hazardous place, a safe place . . . clean it regularly with a Doyle Explosion Proof Vacuum Cleaner. Write for full details.

* The Doyle EXPLOSION PROOF Vacuum Cleaner is U. L. Approved for Safe Operation Under Class 1, Group D and Class 2, Group G.

1. Atmospheres containing gasoline, hexane, naphtha, bensine, butane, propane, alcohols, acetone, bensol, lacquer solvent vapors, or natural gas.
2. Atmospheres containing starch, flour, or grain dust.

Specialists in Industrial Vacuum Cleaning Equipment

Doyle VACUUM CLEANER COMPANY
240 Stevens St., S.W., Grand Rapids, Michigan

New Fullerton plant occupied by American Meter

American Meter Co., Philadelphia, has moved the first unit of its Pacific Coast manufacturing, sales, and general offices from metropolitan Los Angeles, where it has been located for more than 50 years, to its new suburban 20-acre site at 300 N. Gilbert Ave., Fullerton, Calif.

The new 60,000-sq ft, single-story structure has modern production facilities for the manufacture of gas meters and regulators and will provide for expanding warehousing and servicing of commercial and industrial meters and regulators. Employment for more than 100 persons will be provided at the new plant.

The move, announced by George W. Stevenson, general manager of Pacific Coast operations, was made in anticipation of the continued rapid growth of the gas industry in the West. The new suburban location will also provide for future expansion of production facilities.

Students seek more facts about utility operations

Questions asked by four University of Rochester (N. Y.) seniors left no doubt in the minds of the ad men from the Mid-Atlantic region of PUAA that the gas and electric utilities had done a very poor job in familiarizing students with their problems. At the same time, it was made clear that they have been getting much more complete information about government's role in the power industry.

The students were participating in a panel discussion, "A Campus View of the Gas and Electric Business," at the annual conference of the group held recently in the Rochester (N. Y.) Gas & Electric Corp.'s employee center.

Not only did the student-panel discuss various aspects of the utility business and answer questions from the floor about it, but it also fired ques-

tions at the group. They pointed out how they would welcome an opportunity to learn more about the business and felt that more information was definitely needed if students in general were to get the facts straight about the gas and electric utility industry.

Other discussions were: "Advertising in Disguise—Do We Think It Is Wise?", by James J. Brady, Rochester Gas, and Merrell M. DuBois, Rochester *Times-Union*; "A Bird's Eye View From Washington," by Curtis Morris, AGA Washington office, and Arthur Barnett, National Association of Electric Companies; "Where Is the Discount House Taking Us?", by Stephen Masters, Masters' Inc., and Walter C. McKie, Rochester Gas; "How to Get Greater Advertising Impact," Dr. Paul Lyness, Gallup & Robinson Corp.; "Who's Listening?", by Fischer Black, *Electrical World*; "How to Be a Good Neighbor," a panel discussion presided over by William Brady of Consolidated Edison Co. of New York, with Robert W. Wilson, Potomac Electric Power Co., and George Minasian, ConEd.

E. S. Pettyjohn resigns after 10 years at IGT

E. S. Pettyjohn

E. S. Pettyjohn, since 1945 director of the Institute of Gas Technology, has announced his resignation. Dr. Henry R. Linden, research director, will serve as acting director until a successor to Captain Pettyjohn is selected.

Captain Pettyjohn, with broad operating and research experience in the gas industry, and eight years as a professor of chemical engineering and gas engineering at the University of Michigan, was appointed director of IGT in 1945 after service with the navy in World War II. In 1952 he was named vice president in recognition of his contribution to the institute's rise to its present eminent position in the fields of research and education.

Columbia subsidiaries make moves to reorganize

In line with the corporate simplification program launched by Columbia Gas System (see December GAS, p. 8), merger plans are under way in Kentucky and Ohio.

Under the Ohio proposal, Natural Gas Co. of West Virginia, serving 34,000 customers in nine eastern Ohio

Twenty-eight thousand metermen drowned in flooded basements last year!

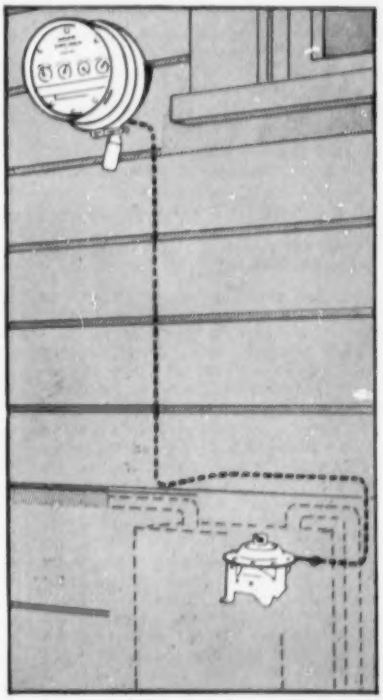
We thought this figure was a little high too—so we decided to do some checking. The results aren't in yet, but you'll have to admit, it's an alarming figure.

It's especially alarming when you consider that these men didn't have to go this way. It all could have been avoided.

You see the Sangamo Electric Company has a new device which installs on the regular tin meter and brings the gas meter reading outside the house.

With the meter reading outdoors, the meter reader never has to enter the house. He's never exposed to the terrors of the average basement. No booby-trapped staircases, no lethal clotheslines, no provoking search for the elusive meter. And no tracking in mud to upset the lady of the house.

We wrote everything down we thought you'd like to know about Telemeters and had it published under the title, "Outdoor meter reading is here..." or Bulletin 802. We've reserved a copy for you, so write for it today.



it's easier to get the reading ON THE OUTSIDE!

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

- Comfortably heats workers and machines within radiation area.
- Heat not wasted on air which would normally rise to ceiling.
- No fan, motor or electrical connection needed.
- Never shut down due to power failure.
- Heat delivery cannot be diverted by drafts from open doors.
- No moving parts . . . less maintenance.
- May be used with any commercial type gas fuel.

Remember how comfortable it feels to stand in the warm sun on a cold day? That's how Panelblocs work. Gentle, comfortable heat rays warm everything they touch. You have all the advantages of conventional heaters . . . none of the disadvantages.

Panelbloc uses no fan. This means no drafts (heating is accomplished by guided radiation). With no electrical connections, Panelbloc costs less to install—will continue to operate during a power failure . . . and it heats, not air, but personnel and equipment . . . anything solid.

Panelbloc may be installed in practically any type structure for general heating; for spot heating in an otherwise unheated building; for heating a single room . . . In fact, almost any heating requirement can be solved with Panelbloc. Available in two models: 62,500 btu and 125,000 btu input.

For warm air heating check the Prat-Daniel THERMOBLOC Heater . . . used the world over.

THERMOBLOC
Division of
PRAT-DANIEL CORPORATION
6-12 Meadow St. • South Norwalk, Conn.
Send Me Panelbloc Bulletin P-154
Name_____ Title_____
Company_____
Address_____

news • *Continued*

communities, would be merged into Ohio Fuel Gas Co., serving 600,000 in central and southeastern sections of the state. Natural Gas Co. is now operated as one of the Pittsburgh Group companies.

Central Kentucky Natural Gas Co. has asked the Kentucky PSC for permission to sell its transmission and storage facilities to the New Kentucky Gas Transmission Corp., recently empowered to operate in the state.

Voters choose private ownership of power service

In an unprecedented action, citizens of Stevens county, Wash., have voted to sell the electric power and light properties of the Stevens County Public Utility District to the Washington Water Power Co.

It was the first time since the Public Utility District law was passed in 1930 that the people living in a county served by an active PUD had been given the chance to vote on what kind of power service they prefer. Nothing in the Washington PUD law provided for such a precedent-establishing election. It was only when a 150-man delegation of townspeople and farmers visited the PUD commissioner's meeting and demanded the right to put the matter to a vote that the commissioners consented to do so.

The PUD agreed to sell its properties for $2,905,000 if three-fifths of the voters approved the sale. Unofficial returns showed a vote of 71.1% in favor of the sale to the company, far more than the 60% needed for approval.

If three-fifths had not approved, it was agreed that the PUD would acquire the properties of Washington Water Power in the county for $3.1 million. PUD had been serving 2350 customers in the area while Washington Water Power, a tax-paying company, serves 2900 customers in the same territory. The two had agreed that it was uneconomical for both to operate in the area.

Major heating expansion kicked off by A. O. Smith

As many as 60 new models will be added to A. O. Smith's warm air furnace and summer air conditioning lines this year. With production dates ranging from January to summer on the various sizes and types of furnaces, the new heating and air conditioning lines by the end of 1956 will include 82 models in both gas and oil-fired types, ranging from 70,000 to 245,000 Btu/hr input ratings.

Approximately $1 million of a multi-million dollar expansion of the Kankakee, Ill., works scheduled for the next two years has been allocated to the heating and air conditioning products section and will involve the addition of nearly 200,000 sq ft of manufacturing space for furnaces and air conditioning equipment alone.

In general, the smaller sizes of new furnaces will be aimed to sell for smaller new home installations, while the new large size furnace models are aimed at the replacement market in larger older homes and for use in custom-built homes.

REGISTRY OF CONSOLIDATED GAS UTILITIES CORPORATION RADIO UNITS

SERVICE DEPARTMENT CODE

Consolidated Gas Utilities Corp. (Oklahoma) has developed this new radio registry card to fit the requirements of their base stations, remote console locations, and service cars. It features a service department code that has proven advantageous by actual operating experience with it at the Lawton, Okla. distribution system. They report that it provides for a uniform code for company-wide use and also reduces the time on the air.

Escalator clause upheld by Virginia high court

Virginia's supreme court of appeals has upheld the constitutionality of an escalator clause in fixing natural gas rates, whereby gas distributors are permitted to pass on to their retail customers increases and decreases in the wholesale cost of natural gas without a public hearing.

The high state court upheld the state corporation commission, which had granted the Virginia Electric & Power Co. and six other gas distributors permission in October 1954 to use the escalator clause.

Ark-La. abandons retail appliance sales

Arkansas Louisiana Gas Co. planned to discontinue the retail sale of household appliances in territory it serves in Arkansas on Jan. 1, with the exception of air conditioning equipment. Present inventories were to be liquidated by that date.

President J. C. Hamilton, announcing the change of policy, commented that "elimination of this phase of our operation is in line with our current program of streamlining operations and reducing expenses in order to meet the continuing rise in the cost of natural gas at the wellhead."

$9 million B. C. Electric plan moves into high gear

When the FPC approved importation of Peace river gas into the United States, and the exporting of American gas into British Columbia, the B. C. Electric Co. put into high gear a $9 million program to bring natural gas to the metropolitan Lower Mainland. This sum will be expended by late summer or early fall of 1956 when the new fuel becomes available in the area. A continuing gas program, which will exceed $15 million by 1959, will then be carried out.

Summarizing the natural gas situation in British Columbia, H. L. Purdy, BCE vice president, brought out these points:

B. C. Electric is now certificated to serve Vancouver, New Westminster, North Vancouver, Burnaby, Richmond, University endowment lands, Port Moody, Port Coquitlam, Fraser Mills, Annacis Island, and D. L. 172. The company will be ready to deliver gas to these areas by the time the fuel reaches the Lower Mainland.

Hearings have been concluded on the company's application to the PUC for a certificate to serve the Fraser Valley.

Sherman Power Digger Saves 70% on Digging Costs

The I. & M. Contracting Company, the Bronx, New York, owns two Sherman Power Diggers. With these units, the company has reduced digging and trenching costs 70%. Jobs are finished on time whether digging bellholes or several hundred feet of trench in all types of soil and under all types of digging conditions. Result: Money saved for the customer *and* the contractor.

Because the Sherman Power Digger is versatile, easy and economical to operate, and highly maneuverable in tight places, it is the ideal unit for pipeline and refinery maintenance. It digs as deep as ten feet below grade, in mud, hardpan, shale, oiled and blacktopped roads, and stony ground. It is sold and serviced locally by your Ford Tractor Dealer. See him today for a demonstration or write for free Bulletin No. 432.

*Designed, Engineered and Manufactured Jointly by Sherman Products, Inc., Royal Oak, Michigan. Wain-Roy Corporation, Hubbardston, Mass.

Patent No. 2-303-852
Other Patents Pending

©1955 Sherman Products, Inc.

Sherman
PRODUCTS, INC.
ROYAL OAK, MICHIGAN
POWER DIGGERS* • FRONT END LOADERS • FORK LIFTS

More than $3,750,000 worth of pipe, from 22-in. to small distribution size, has been ordered with first deliveries set for early this month.

Mannix Ltd. has the contract to build the 36-mile, 18-in. line to bring gas from Huntingdon to the city gate in Surrey. Mannix will also lay the line across Pattullo bridge and on to join the Greater Vancouver grid. Right-of-way for the 18-in. line is being acquired and land for the receiving and LPG storage facilities in Surrey has already been purchased. The nerve center of the system will be a $900,000 distribution setup in Burnaby.

Artist's conception of East Ohio Gas Co.'s million-dollar service center to be built on Cleveland's westside this spring. The 28,000-sq ft center will serve primrily as a headquarters for customer servicemen and their vehicles. Included will be a garage to house upwards of 50 vehicles, warehouse, a complete auto and truck lubrication and repair shop with modern lifts and wash racks, and office quarters for customer service personnel.

Cost to BCE of converting some 100,000 customer appliances will approximate $1 million.

Standby storage for L. P. gas will be substantially expanded and two existing carburetted water-gas plants will be converted to oil-gas.

Starting in 1956, the Lower Mainland will receive gas over the Pacific Northwest system. Sometime in 1957, when Westcoast Transmission Co.'s 650-mile line from the Peace river area is completed, B. C. Electric will draw all its requirements from this source, except in the event of a major emergency.

As much as 50 MMcf daily may be drawn from the Westcoast line. As further development takes place in the Peace river fields, an additional 25 MMcf/day may be tapped. Beyond this, if consumption in the U. S. develops as expected, it will be necessary to increase export from the initial maximum of 300 MMcf/day to 400 MMcf. In that event, BCE has the right to draw another 55 MMcf daily from the Canadian pipeline, for a grand total of 130 MMcf/day in the later states of the contract.

Feb. 1 deadline set for PUAA Better Copy contest

Plans for the 1956 Better Copy contest, sponsored annually by the Public Utilities Advertising Association, are under way, with chairmen selected to head up the contest's 22 classifications.

Entries for the 1956 contest, which will judge advertising produced in

LOCATES VALVES QUICKLY

even under heavy snow, ice, black top

the NEW AQUA VALVE BOX LOCATOR

The miraculous new Aqua locator takes you directly to the valve box . . . *even when the ground is covered with snow, ice or black top.* Saves hours of back-breaking digging in hard, frozen ground.

And you get pinpoint accuracy, with no needle nervousness. Aqua "electric braking" action reduces needle spinning to absolute minimum.

One in every truck...

Many gas and water departments have the Aqua locator on every service car and truck. Saves time and expense of emergency runs.

$29.50 f.o.b. CINCINNATI

Your Name in Gold Free

- Top-view reading. No stooping.
- Factory adjusted to your geographical location.
- Instrument includes compass.
- New high impact Styron plastic case virtually indestructible
- Compact, convenient, non-variable.
- Guaranteed to function regardless of ground cover.

Our Canadian Distributors:

Canadian Brass Co., Ltd.
Galt, Ontario, Can.

Francis Hankin Co., Ltd.
2028 Union Ave.
Montreal, Can.

Prices slightly higher in Canada

FREE 15 DAY TRIAL

AQUA SURVEY & INSTRUMENT CO.

2512 Leslie Avenue, Cincinnati 12, Ohio

FREE TRIAL MAIL COUPON

Gentlemen: Please send me

☐ New Aqua Valve Box Locator for FREE 15 day professional trial, without obligation.

☐ Detailed literature on new Aqua Valve Box Locator.

NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

1955, will be submitted this month, with a Feb. 1 deadline. Deadline for annual reports is April 2. Winners will be awarded certificates during PUAA's annual convention slated for May 10-11 in Philadelphia.

New blast furnace planned by U. S. Pipe

Several million dollars will be invested by U. S. Pipe & Foundry Co. for construction of a new blast furnace adjacent to the company's coke oven plant in North Birmingham, Ala.

The new furnace, expected to boost pig iron production at U. S. Pipe from 50,000 tons a month to 80,000, will have a capacity of 1000 tons of pig iron a day.

Pacific Refiners sells LPG business to Honolulu Gas

Bulk facilities of Pacific Refiners Ltd. have been sold to Standard Oil Co. of California for $2,425,000 and its L. P. gas business to Honolulu Gas Co. for 81,000 shares of the gas company's common stock.

Honolulu Gas stockholders had approved the purchase agreement, which needs approval by the territorial PUC. Standard Oil is buying refinery facilities for diesel fuel and asphalt products in connection with its plans to build a $30 million oil refinery at Honolulu harbor.

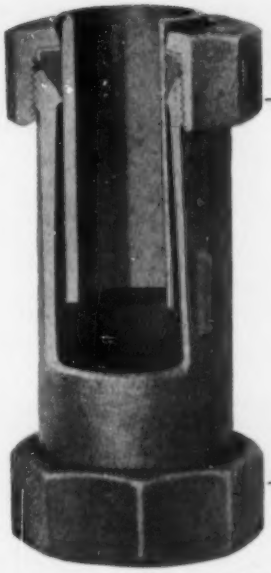
Dissolution of Pacific Refiners and liquidation of assets were approved by PR stockholders. They will receive one share of Honolulu Gas stock, valued for this transaction at $13.40 a share, and $19 in cash for each 19 shares of Pacific held.

GAS news notes

The Kansas City (Mo.) district office of General Controls Co., Glendale, Calif., has moved into new and larger facilities. The expansion is predicated on increased service to customers in the local area, Omha and Wichita branch office territories, and to several counties in Kansas and Missouri.

Logistics Research Inc., Redondo Beach, Calif., is making its Alwac digital electronic computer available on a contract basis. The service will be available to those organizations requiring the needs of a part-time computer and to present computer users with extra heavy work loads.

IGT elected four new members to the board of trustees during its annual meeting in Chicago. They are Henry Tuttle, president, Michigan Consolidated Gas Co., Detroit; J. McWilliams Stone, president, DuKane Corp., St.



NORMAC

Couplings, Sleeves and Fittings

for maximum deflection, ease of "stabbing," complete confinement of the rubber!

So close are "Normac" rubbers confined at the gasket tip that possibility of flow is reduced almost to "nil." These couplings, sleeves and fittings . . . approved by gas utility men across the country for their time-saving features, ease of handling and dependable service . . . are available in a complete range of sizes. Made from air furnace malleable iron they provide greater wall thickness than pipe on which used.

NORMAC COUPLINGS are made with 5" centers in all sizes. NORMAC SLEEVES are identical in design except that they are made with 10" centers. Nuts and gaskets are interchangeable.

Compression-End Service "Tee"—First fitting of this type ever produced with full coupling depth and special threads on male end to prevent dropping into old hand taps when used to replace standard threaded fittings.

Compression-End Service "Ell" — Extra depth makes it possible to "stab" pipe into stops and without measuring, pull back a safe distance to allow ultimate deflection eliminating possibility of strain against tap in main.

Compression-End Iron Body Brass Core Service Stopcocks—End the necessity of threading on the job plus the elimination of the threads themselves—combining all the advantages of NORMAC COUPLINGS and the best in stopcock design. 2½" coupling depth on each end.

Normac Brass Fittings Developed in 1939 for Use with Copper Tubing—Our complete line of brass fittings can be used either on new installations or where copper is run through old steel pipe in large or small openings. The center to end dimensions of NORMAC TEES correspond with old malleable iron fittings. This feature is extremely important in the use of these fittings in one foot openings where the tubing must line up with the steel which has been removed.

Write for the NORMAC CATALOG of Gas Distribution Equipment

NORTON-McMURRAY MFG. CO.

122 SOUTH MICHIGAN AVENUE - - - CHICAGO 3, ILLINOIS

Couplings • Meter Bars • Sleeves • Cocks • Bell Joint Clamps • Service Tees & Ells

Charles, Ill.; E. H. Tollefson, president, Hope Natural Gas Co., Clarksburg, W. Va.; and Sheldon Coleman, president, Coleman Co., Wichita, Kan. Eskil J. Bjork, president of Peoples Gas Light &Coke Co., Chicago, is one of five new members elected to the board of trustees of Illinois Institute of Technology.

To help meet a critical gas shortage, Central West Utility has Missouri PSC approval to build a $170,000 LPG plant in Clay county which will be able to furnish up to 2 MMcf of gas daily. Despite opposition by the City of Kansas City, which claimed that the plant site was planned for residential purposes, the PSC granted permission to Central West, stating that "in view of the immediacy of the need . . . the commission does not consider the objections substantial."

A new principal of magnetic amplification is employed in Remington Rand's high speed electronic computer which utilizes magnetics throughout in lieu of filament tubes. The new amplifiers, known as Ferractors, will perform accurately at temperatures that range from —60° F up to 220° F.

ARCCO
ARCCO ... NOW
OFFERS
8 DAY
CHARTS
and
ROCKWELL CHART DRIVES
EIGHT-DAY ARCCO CHARTS are now available for use on practically all Rockwell-Emco, Foxboro and Westcott orifice meters. Eight day charts for other instruments soon available.
With this NEW Chart Drive 11 rotation speeds are possible. Turrets are available for 2, 3, 4, 6, 8 and 12 hours, also for 2, 3, 7, and 8 day rotation. Standard hub gives 24 hour rotation.
ROCKWELL CHART DRIVES are ruggedly built and are sealed for years of trouble-free service. The drives are adaptable to practically every type of instrument using circular charts. The price is $13.75 each. Turrets are $4.25 each F.O.B. Los Angeles, Calif., or Tulsa, Oklahoma.
AMERICAN
RECORDING CHART CO.
3113 E. 11th St. • Los Angeles 23, Calif.
SEND FOR DRIVE AND CHART BULLETIN
SEND FOR BULLETIN NO. 104-R

GAS calendar

1956

January

13..SGA Air Conditioning Sales Conference—Jackson, Tenn.

16-18..Pipeline Contractors Association 8th Annual Convention — Boca Raton Hotel & Club, Boca Raton, Fla.

19..NEGA Operating Division -- Hotel Statler, Boston.

20..SGA Air Conditioning Sales Conference and Employee Relations Conference — Shamrock Hotel, Houston.

26-27..Fifth Annual Instrument Short Course — Los Angeles Harbor Junior College, Wilmington, Calif.

27..SGA Accident Prevention Conference — Jung Hotel, New Orleans.

February

15-17..Tulsa Corrosion Short Course for Pipeliners (NACE) — Mayo Hotel, Tulsa.

16-17..SGA Accounting Management Conference and Sales Executives Conference — Jung Hotel, New Orleans.

March

1-2..SGA Distribution Management Conference and Transmission Management Conference — Jung Hotel, New Orleans.

12-16..National Association of Corrosion Engineers Annual Meeting — Hotel Statler, New York.

19-21..MidWest Gas Association — Hotel Fontenelle, Omaha.

22-23..New England Gas Association Annual Meeting — Hotel Statler, Boston.

22-23..Oklahoma Utilities Association Annual Convention — Oklahoma City.

April

4-6..AGA General Management Section Spring Conference — Conrad Hilton Hotel, Chicago.

13-14..Florida-Georgia Gas Association General Management Conference — Lakeside Inn, Mount Dora, Fla.

16-18..National Conference of Electric & Gas Utility Accountants — Hotels Biltmore and Commodore, New York City.

16-19..AGA Sales Conference on Industrial & Commercial Gas —Hotel Roanoke, Roanoke, Va.

17-19..Southwestern Gas Measurement Short Course — University of Oklahoma, Norman.

19-20..Indiana Gas Association — French Lick Springs Hotel, French Lick, Ind.

19-21..GAMA Annual Meeting — The Greenbrier, White Sulphur Springs, W. Va.

23-25..Southern Gas Association Annual Convention—Dallas.

23-25..AGA-Midwest Regional Gas Sales Conference — Edgewater Beach Hotel, Chicago.

May

6-9..LPGA Convention and Trade Show—Conrad Hilton Hotel, Chicago.

7-10..AGA Distribution, Motor Vehicles, and Corrosion Conference—Congress Hotel, Chicago.

7-11..AGA Commercial Gas School — Edgewater Beach Hotel, Chicago.

10-11..AGA Gas Supply, Transmission & Storage Conference—Conrad Hilton Hotel, Chicago.

16-18..AGA Chemical Engineering & Manufactured Gas Production Conference — Philadelphia.

22-24..Pennsylvania Gas Association —Pocono Manor Inn, Pocono Manor, Pa.

24-25..Natural Gas & Petroleum Association of Canada—Sheraton Brock Hotel, Niagara Falls, Ont., Canada.

June

24-27..Canadian Gas Association—Manoir Richelieu, Murray Bay, Quebec.

25-26..Michigan Gas Association—Grand Hotel, Mackinac Island, Mich.

September

11-13..Pacific Coast Gas Association Annual Meeting—Coronado, Calif.

October

Week of Oct. 15..AGA Annual Convention—Atlantic City, N. J.

only vibra-pak anodes offer all 3
1
SPECTROGRAPHICALLY ANALYZED
Assures highest degree of operating efficiency.
3
UNIFORM BACKFILL
Exclusive VIBRA-PAK means longer anode life.
2
THIN SPIRAL CORE
Perfectly bonded — gives more useful current per anode.
No matter what the installation — pipelines or well casing, marine or subsurface — VIBRA PAK is your best anode buy!
Standard Magnesium Corporation
P. O. BOX 1424G • TULSA, OKLAHOMA

FATCHEMCO T.E.B.

A Universal Tar Emulsion Breaker

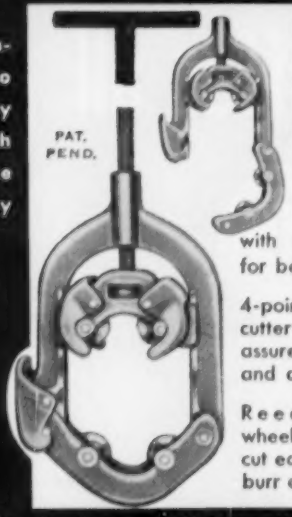
Eliminate tar emulsion "headaches"
Produce dry tar efficiently
Save Money on Time, Steam Costs and Labor
Proved in use by over 100 Gas Companies

Write for information and sample

UNIVERSAL CHEMICALS CORPORATION
Lonsdale, Rhode Island

IF YOU CUT LARGE DIAMETER PIPE...
YOU NEED THESE
New REED HINGED 4-WHEEL PIPE CUTTERS
Four sizes cover the range from 2½" to 12"

Users tell us these completely new cutters are so efficient they often "pay for themselves" through the savings in crew time on a half-dozen cuts. They are the first really practical tools for cutting off steel or cast iron pipe in sizes from 2½" to 12". You can, for example, cut 8" steel pipe completely off in less than five minutes.



Four wheel design requires minimum swing of handle—less digging in ditch work, easier "tight-corner" cuts.

Closed frame permits light weight with complete rigidity for better cutting.

4-point guide aligns the cutter on the pipe . . . assures perfect tracking and a right angle cut.

Reed Razor Blade wheels track perfectly, cut easily and roll down burr on steel pipe.

Unconditionally guaranteed to be the most efficient cutter you have ever used. Ask your jobber or write for literature.

REED MANUFACTURING COMPANY
ERIE, PENNSYLVANIA • U. S. A.

Be Completely Insured!
RELY ON
NEW ENGLAND FORESTRY SERVICE

the complete
Gas
Leak Location
and
Mitigation
Survey Program

Vegetation Surveys*
Building Inspection Surveys
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EDSON F. WHITE, *Operating Manager*

Special Representative
J. E. B. GIBBONS
44 ABBOTT ROAD, BRADFORD, PA.

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COLLECT to
NEW ENGLAND FORESTRY SERVICE, INC.
281 MAIN STREET, READING, MASS.
Tel. REading 2-2525

*Originator of Vegetation Surveys for Gas Companies in 1934

UNIVERSAL
INSULATED
METER NUTS

QUICK INSTALLATION!
POSITIVE INSULATION!
LABOR SAVING!

Gas never touches nylon liner . . . gasket holds pressure. Installation in less than five minutes with no repiping required. Sizes for all iron or tin meters with swivels ½" to 2" pipe sizes, inclusive. Write for bulletin 522.

UNIVERSAL
CONTROLS CORPORATION
P. O. BOX 13122 WALNUT HILL STA.
DALLAS 20, TEXAS

GAS people

Promotions

H. R. Searing

H. C. Forbes

Consolidated Edison

Election of H. R. SEARING as chairman of the board and HARLAND C. FORBES as president has been announced by Consolidated Edison Co. of New York. Mr. Searing had been ConEd's president for almost seven years and its chief executive officer since 1953. In his new post he remains chief executive officer. Mr. Searing, who joined a ConEdison predecessor 46 years ago, played a leading part in integrating the operating facilities and personnel of the electric, gas and steam utilities, which were successively merged to create the present unified system. Mr. Forbes joined ConEd 31 years ago. Under his direction as system engineer and later as vice president, the expansion of ConEd's physical plant was plotted to meet the increased demand for utility services during the post-war period.

American Car & Foundry division, ACF Industries Inc., has named NORMAN E. CARLSON as director of engineering. He will continue as works manager of the St. Charles plant.

FRANK M. REINHOLD, purchasing agent of Connecticut Light & Power Co., Berlin, has been elected a vice president of the company.

Four key personnel changes at national headquarters of Rockwell Manufacturing Co.'s meter and valve division have been announced. JACK H. WALTERS is now manager of gasoline and oil products. He is succeeded as gas products manager by ROBERT B. KITZMILLER, formerly San Francisco district sales manager. T. O. CARSON, assistant product manager, Nordstrom valves, has assumed the additional responsibility of manager of distributor sales. M. F. GROOM, a sales engineer from the Houston district, has been named assistant manager of distributor sales. Rockwell has also named

JOHN ROBERT DIAMOND, *formerly* manager of procurement and selection for Pennsylvania Salt Manufacturing Co., to the newly created post of personnel manager.

CLARENCE WANTZ has been named chief engineer in charge of the engineering department of Robertshaw Thermostat division of Robertshaw-Fulton Controls Co. He replaces M. C. POTTER, who has resigned. Mr. Wantz developed the first practical timer controls for top burners of gas ranges, which were introduced last year.

C. Wantz
Robertshaw

E. M. Kelley
So. Union

E. M. KELLEY, El Paso district manager of Southern Union Gas Co., Dallas, has been promoted to southern division manager of the company's western properties. Mr. Kelley, whose headquarters will remain in El Paso, will supervise and assist in the operations of the southeastern New Mexico and west Texas districts in addition to his present supervision of the El Paso and Alamogordo districts.

MARVIN L. STARK, who has been director of engineering for the past two years, has been elected vice president, engineering and development of Peerless Manufacturing Corp., Louisville, Ky.

LEE H. CLARK, general manager of the Sharples Chemicals division of the Pennsylvania Salt Manufacturing Co., has been named vice president of the parent company.

JOHN M. JACOBS, a director since 1945, has been elected chairman of the board of Arizona Public Service Co., Phoenix. He has served as chairman of the board's operating committee.

General Controls Co., Glendale Calif., has promoted B. L. LERCH to midwest regional manager. NORBERT A. GRAINER has succeeded him as manager of the firm's Chicago branch. The company has also announced that DOUGLAS S. STERNER has rejoined the company as manager of the air conditioning-refrigeration division. Two re-

Opens 25 feet of trench per minute

On transmission lines between cities, and on distribution and service lines in town, Parsons 150 wheel-type Trenchliner combines big production capacity with precision grading accuracy. It digs 16 to 26 inches wide, at depths to 5¾ feet. 30 digging feeds up to 25 feet per minute assure maximum trench production at every width, depth, and in all soil conditions.

Specified grades are easy to maintain. A hydraulic ram on vertical mast raises and lowers the digging wheel with fractional inch accuracy — giving minute depth adjustments. (A separate hydraulic ram tilts the mast — balances weight of the wheel forward on machine for traveling or trailer-loading.)

To suit dry or wet digging conditions, quick-change buckets on the heavy-duty digging wheel have gumbo lips, or self-sharpening, reversible "Tap-In" teeth. Buckets are all cast-steel — and are available with solid or tine backs.

Hinged crumber sweeps trench bottom clean, ready for pipe. Shiftable reversible belt conveyor, 24 inches wide, places the spoil bank on either side of the trench.

This Parsons 150 Trenchliner also has standard tractor crawlers with 16-inch treads and lug-type shoes (street pads optional). It is also available with 12-inch treads and flat shoes for city work. You also have a choice of 60 h.p. gas or diesel engine. Better look into this 150 Trenchliner today. See your Parsons distributor — or write for 150 bulletin.

mail to: PARSONS CO., Newton, Iowa for literature on wheel-type Trenchliners: ☐ 150 ☐ 215

NAME _____ TITLE _____

COMPANY _____ DIV _____

STREET _____

CITY _____ STATE _____

Also interested in: ☐ ladder-type Trenchliners . . . ☐ rubber-tired Trenchmobile®

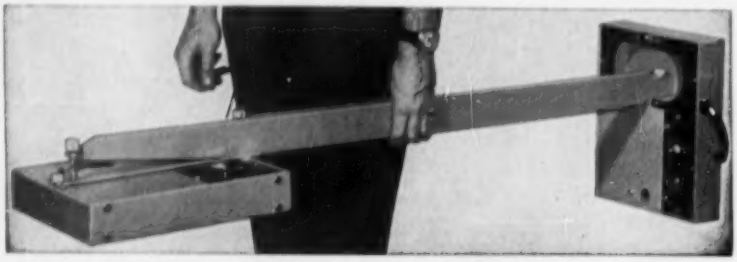
P554 GAS

PARSONS TRENCHLINERS®
(Koehring Subsidiary)

THE WILKINSON LINE LOCATOR

Detects Position and Depth of Any Sub-Surface Pipe, Cable, Stub, Valve, Coupling, etc.

Originators of the modern, lightweight locator, Wilkinson is again first with etched circuitry for better uniformity and quality control. With cases now made of rugged phenolic material, the Wilkinson Line Locator is the most all-round dependable instrument on the market today.



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WILKINSON PRODUCTS COMPANY

3987 Chevy Chase Drive • Pasadena 3, California • SYlvan 0-4314

A Positive Check Against Reverse Flow with

NORWALK DISC TYPE CHECK VALVES

For Low and High Pressures Gas and Air

Can be supplied in sizes 8" thru 36" and special sizes on application. Easily lubricated through grease fitting. Indicator shows position of disc. Can be counter-balanced for vertical jobs. Dash pot can be installed to prevent chattering when passing high velocity gas or air.

NORWALK VALVE COMPANY
Railroad Avenue
South Norwalk, Conn.

WARRENGAS
A LIQUEFIED PETROLEUM GAS OF HIGHEST QUALITY

WARREN PETROLEUM CORPORATION
LIQUEFIED PETROLEUM GAS DIVISION
TULSA, OKLAHOMA

SALES OFFICES:
FORT WORTH, TEXAS
HOUSTON, TEXAS
LOUISVILLE, KENTUCKY
MADISON, WISCONSIN
MIDLAND, TEXAS
JACKSON, MISSISSIPPI
ST. LOUIS, MISSOURI
NEW YORK, NEW YORK
OMAHA, NEBRASKA
COLUMBIA, SOUTH CAROLINA
TAMPA, FLORIDA

people • *Continued*

gional representatives recently appointed are JACK CROUSHORE, supervisor of division activities of the Chicago regional office, and RAY WHEELER, in charge of the Columbus, Ohio office.

LOUIS E. HILLENMEYER, Lexington, Ky., has been elected to the board of directors of the Columbia Gas System Inc., New York. He was a director of the Frankfort Natural Gas Co. until May 1955 when that company became a part of the Columbia system by merging into the Central Kentucky Natural Gas Co. His father and uncle helped found Central Kentucky Natural.

HENRY P. J. STEINMETZ, vice president in charge of sales, Public Service Electric & Gas Co., Newark, N. J., retired recently after 48 years of service with the company. He started with the company in 1907 as a stenographer in the gas auditing department. In 1931 he was named general sales manager, electric and gas, and six years later was promoted to vice president in charge of sales. He is a director of the New Jersey Gas Association.

L. A. Bickel

W. F. Wright

Lone Star Gas Co.

L. A. BICKEL has been elected vice president of Lone Star Gas Co., Dallas. He succeeds WESLEY F. WRIGHT, who retired Dec. 1 after 44 years of continuous service. Mr. Bickel will be in charge of operations in the Dallas division of distribution. F. A. GARRETT, division purchasing agent and building manager, succeeds Mr. Bickel as assistant general manager.

CHARLES G. SIMPSON has been elected vice president of United Gas Improvement Co. and appointed general manager of the Philadelphia Gas Works.

Servel Inc., Evansville, Ind., has announced the following promotions: CARL E. DEIG to manuracturing manager; J. N. LANGLEY, manager of production control; JERRY LAINE, manager of the sales service department; A. C. SPECHT, manager of the midwestern region, Chicago. H. IRVING PRATT has

been elected a member of the board of directors. The company has also announced the following new district managers: E. A. DUNHAM, New York; EMIL P. NENSEL, Philadelphia; P. E. ARNOLD, Chicago; HOLLIS G. HAYES, Washington, D. C.; GENE HOLZSCHUH, Seattle; JAMES G. HAYDEN, Minneapolis; CARL P. DUKE, Omaha; and JAMES H. GEORGE, Pittsburgh.

American Cast Iron Pipe Co., Birmingham, has named LEONARD C. PARNELL manager of the Minneapolis sales office. He succeeds D. W. WALLACE who has retired after 46 years with the company, 41 of them as head of the Minneapolis office.

WILLARD F. ROCKWELL JR., president of Rockwell Manufacturing Co., has been elected president of the Pennsylvania Chamber of Commerce. He will serve a one-year term.

DUNCAN HENDERSON has been promoted to administration assistant in charge of sales, a new post within the sales organization of A-P Controls Corp., Milwaukee.

Transfers

B. B. BROWN, formerly business promotion manager of Central Kentucky Natural Gas Co., Lexington, has joined United Fuel Gas Co. as district manager in Ashland, Ky. Mr. Brown is succeeding B. B. SLOAN, who is retiring. JOHN BARKER succeeds Mr. Brown as business promotion manager.

JOSEPH A. CERNY has joined Bryant Industrial Products Corp., Cleveland, Ohio, as director of engineering. He was formerly with Gas Machinery Co., Bryant Heater Co., and Bryant division of Carrier Corp.

IVAN C. RAY, sales engineer for Refinery Supply Co., Tulsa, has transferred to the Houston office as branch manager R. L. HOLMAN replaces Mr. Ray in the Tulsa area sales position.

HOWARD J. BERKEL has been appointed director of personnel for the Bryant division of the Carrier Corp. In assuming his new post, Mr. Berkel relinquishes similar responsibilities for Carrier's Unitary Equipment division.

New faces

S. ALFRED WALKER has joined General Controls Co., Glendale, Calif., as public relations representative.

RAYMOND LAPIERRE has joined Vulcan Rubber Products division of

Safe, smooth pipelaying on Pittsburgh utilities job—by Cleveland "80W."

Same job—same day—same "80W"—backfilling and tamping.

PIPELAYING, BACKFILLING and trench compaction, too, where needed—*each* done expertly by the Cleveland "80W." This modern machine substantially reduces equipment and manpower requirements on underground construction jobs of all types. That's why so many users equip *each* of their crews with a versatile "80W." Check its *complete* performance features—see how it fits your program—put it to work for you. You'll be money ahead when you do.

See your local distributor

THE CLEVELAND TRENCHER COMPANY • 20100 St. Clair Ave., Cleveland 17, Ohio

CLEVELAND

-it's easy when you know how!

And much of the know-how is in using DELAWARE PipeDrivR tools. No more need to use costly make-shift tools. DELAWARE has engineered and field tested a complete set of accessory tools for every pipe driving operation. No threaded parts to jam, no pins to shear off . . . mill wrap is fully protected against stripping. Made from DELSTEEL ALLOY, the DELAWARE PipeDrivR tools are designed to take the toughest service. Big savings in time and cost are yours with dependable DELAWARE tools.

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Paving Breaker and Clay Digger Tools | Hand & Pneumatic Chisels | Hand, Pneumatic & Electric Hammer Drills | Plumbing Tools

DELAWARE TOOL STEEL CORP. Wilmington 99, Del.
FINE TOOLS & TOOL STEELS SINCE 1918
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SALES ENGINEER: Experienced in Gas Pressure Control equipment and installation. Considerable travel required. Will contact our representatives and customers relative to sales and service of pressure control equipment in Gas Distribution and Transmission Industry. Location Southwest. Salary open. Send resume of experience and education with photo in first letter. Box 16, GAS, 198 S. Alvarado St., Los Angeles 57, Calif.

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"ELECTRONIC WITCH"
Especially Designed to Find Hard To Locate Gas Pipes
Price Only $162.50
Free Literature Upon Request
FISHER RESEARCH LAB., INC.
PALO ALTO, CALIFORNIA

Petroleum Service Management Company, Inc.
Consulting Engineers and Geologists
Research, Evaluations, Bank Loan Reports, Investigations, Reports for Underwriting Issues, Well Supervision, Property Management, Contract Leasing, Drilling Deal Recommendations, Purchase of Proven Oil and Gas Properties. Complete management and supervision, U.S.A.-Foreign Refinery Design, Construction and Management. We handle all of your operations on straight retainer and management fee basis, or participating and retainer basis. 306 Commerce Building, Box 1992, Abilene, Texas. Phone 2-9621.

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people • *Continued*

Reeves Brothers Inc. From his headquarters in Akron, Ohio, he will cover a territory composed of Michigan, Ohio, western Pennsylvania, and western New York

HARLAN A. WHITE has joined Mueller Co., Decatur, Ill., as assistant to the administrative vice president. He was formerly a partner in the CPA firm of Gauger & Diehl.

JAMES H. TATE has joined the Atlantic (Ga.) Gas Light Co. as director of the newly created public relations department.

FRANK R. PALMER, president of the Carpenter Steel Co., Reading, Pa., has been elected a director of United Gas Improvement Co., Philadelphia.

MRS. MYRON E. GROSSMAN has joined Ohio Fuel Gas Co. as a home service advisor in Columbus.

Deaths

HENRY FRANK PREDDY, 59, supervisor of the meter department in Lone Star Gas Co.'s general division of distribution, died in November. Death was due to a heart attack. Mr. Preddy had been with Lone Star since 1917.

THOMAS NESBITT MC CARTER, the first president of Public Service Electric & Gas Co., Newark, N. J., and chairman of its board of directors when he retired in 1945, died recently. His 88th birthday was on Oct. 20. Mr. McCarter served as president from 1903 until 1939, when he relinquished that post to become chairman of the board.

EARL D. CLUTTER, 57, vice president of the Manufacturers Light & Heat Co., Pittsburgh, was killed in an automobile collision near Washington, Pa. in November. Mr. Clutter began with Manufacturers 40 years ago as a ditch digger, working his way up to the post of vice president in charge of operations.

HERBERT C. GROSS, manager of Philadelphia Electric Co.'s Delaware division at Chester, Pa., died late in November after an illness of three months. Mr. Gross, 66, joined a predecessor company of Philadelphia Electric in 1912.

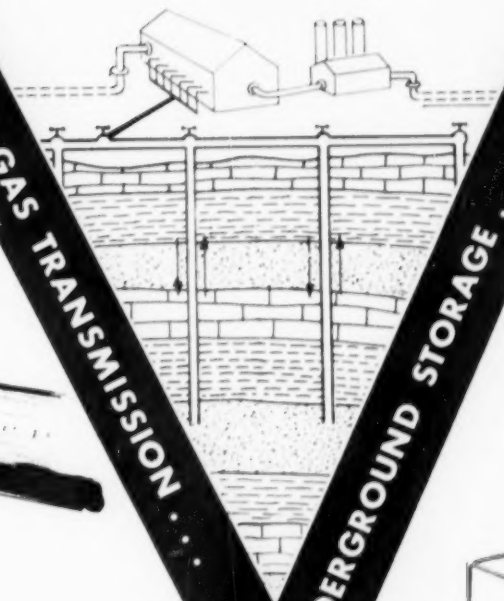
TRANSMISSION • STORAGE • CONDITIONING

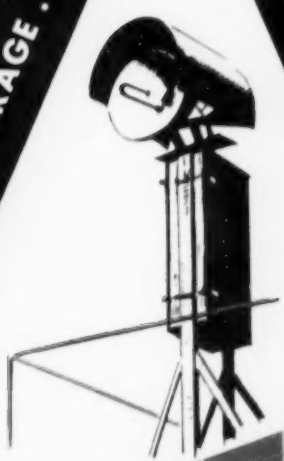
GAS PIPELINE SECTION

ENGINEERING • CONSTRUCTION • MAINTENANCE

The decade since the War

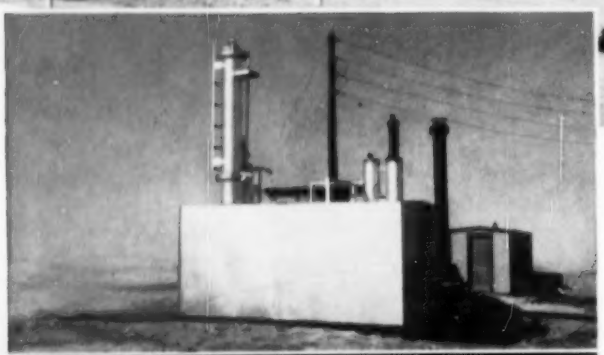
FEATURING PROGRESS IN GAS TRANSMISSION . . . UNDERGROUND STORAGE . . . MICROWAVE COMMUNICATION





● TURN TO PAGE 107

NATIONAL GLYCOL DEHYDRATION AND LOW TEMPERATURE EXTRACTION (LTX®) Equipment



National 500 mcf/day, 125 # WP Glycol Dehydrator — N. Dakota

National 17 mmcf/day, 1000 # WP Glycol Dehydrator — Kansas

A 30" x 12½', 1200 psi LTX with Glycol Injection and a 24" x 15', 300 psi Stabilizing Desorber for 10,000 mcf per day operating on lease in South Texas.

This producer is realizing

MAXIMUM DOLLAR RECOVERY FROM HIS RESERVOIR

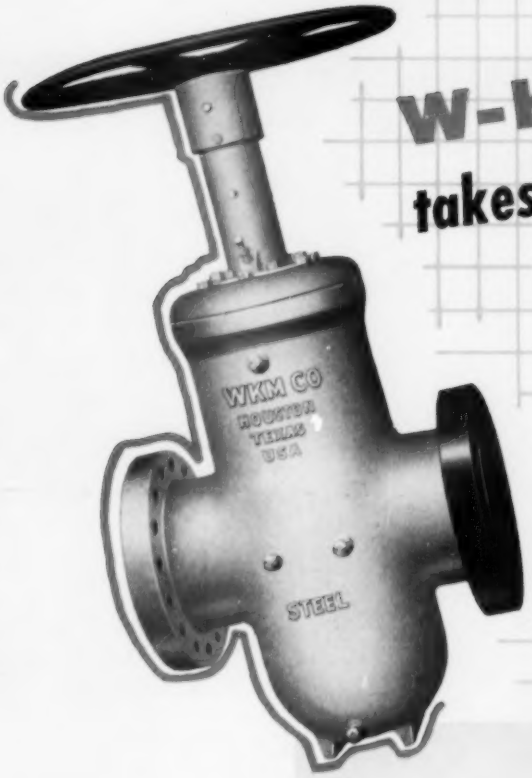
It's National®

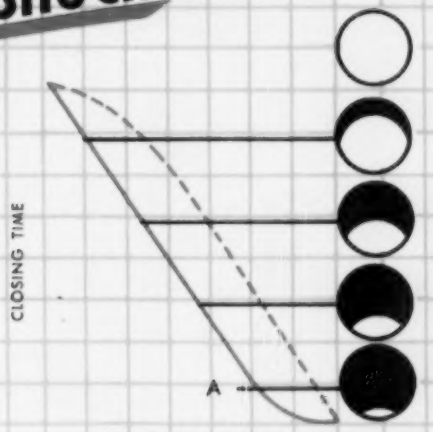
NATIONAL TANK COMPANY

TULSA, OKLAHOMA

6-6-55

W-K-M Eclipse Closing . . . takes the SHOCK out of Line Surge





Dotted line shows closing curve of conventional gate valve.

• Regardless of volume or pressure flowing through a W-K-M Valve, it can be closed as fast as required without setting up dangerous surges. In W-K-M Through-Conduit Valves the basic design of the gate and segment provides the right variable ratio of port area to gate travel to close the valve without surging.

The no-surging action of eclipse closing is illustrated by the curve above. From full-open to point A, the rate of closing is almost a straight line. From point A (about 70% closed) the rate of close slows as it approaches the fully-closed position. This gradual close-off at the critical point brings the flow through the valve to a smooth stop rather than a sudden halt—consequently there is no surging.

In addition to this fine feature W-K-M Through-Conduit Valves have many others that make them the leader in long-life, trouble-free performance for every purpose.

W-K-M Valves

W-K-M MANUFACTURING COMPANY, INC.

A SUBSIDIARY OF acf INDUSTRIES INCORPORATED

P. O. Box 2117, Houston 1, Texas Los Angeles, California

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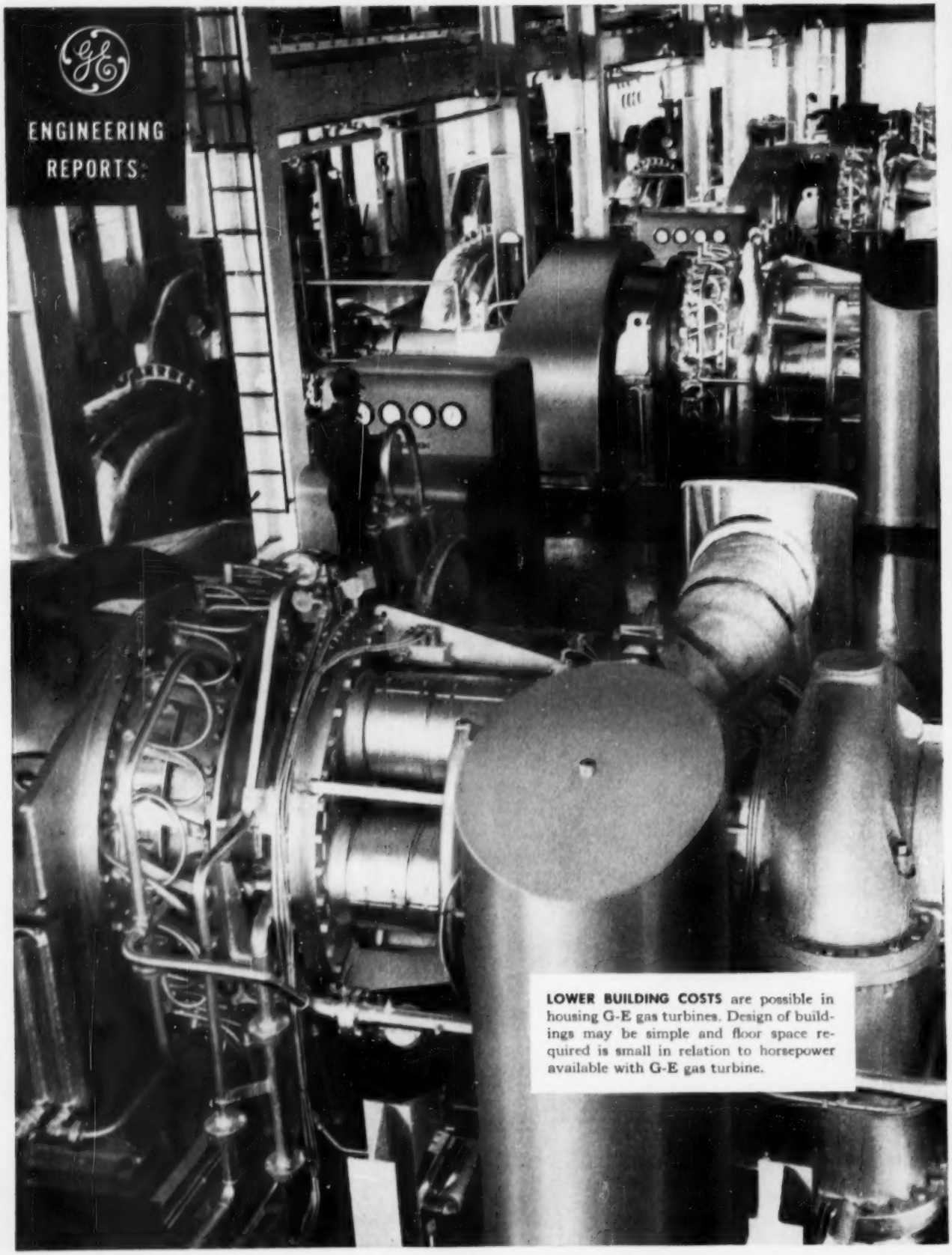
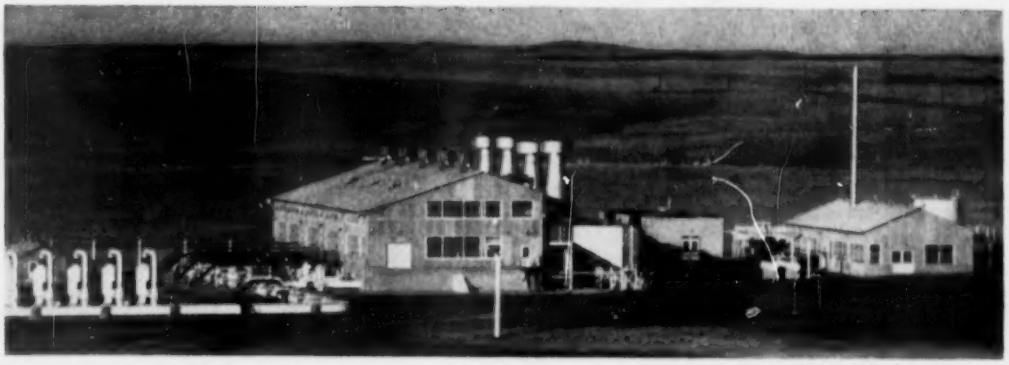
MOST OF THE WORLD'S NEWEST PIPELINES ARE TIED TOGETHER WITH W-K-M VALVES



LOWER BUILDING COSTS are possible in housing G-E gas turbines. Design of buildings may be simple and floor space required is small in relation to horsepower available with G-E gas turbine.



41 G-E GAS TURBINES now operating in gas pipeline industry have proved to be economical power sources.

8 G-E gas turbines for Northern Natural Gas give up to

25% MORE HP FOR PEAK LOADS

A total of eight 5700-hp General Electric gas turbines are now in operation at the Tescott and Macksville compressor stations of Northern Natural Gas Company in Kansas.

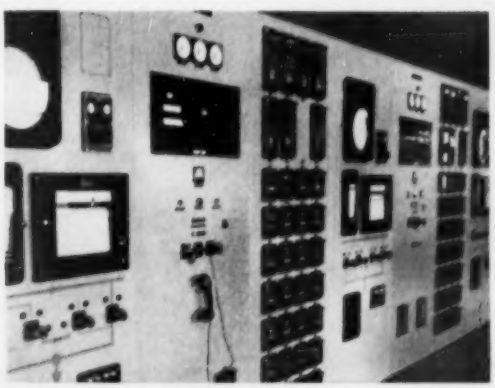
These complete, economical prime movers have this fundamental characteristic: horsepower increases as ambient temperature decreases. Thus, during cold weather, when demand is greatest, up to 25% more power may be delivered.

Proven economies of operation and maintenance explain why many natural gas pipeline stations are being planned for G-E gas turbines. Have you investigated their many advantages?

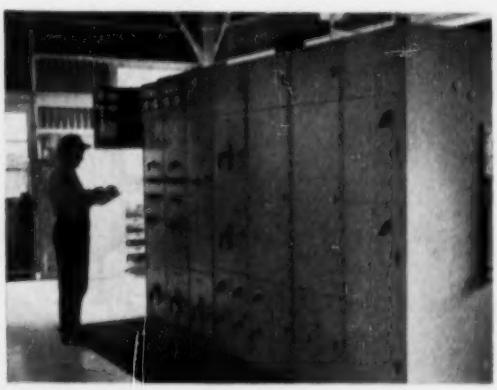
For more information, contact your nearest G-E Apparatus Sales representative, or write for information bulletin GEA-5962 to General Electric Company, Section 661-52, Schenectady 5, New York.

Combustion Gas Turbines for the Gas Pipeline Industry—Backed by over 50 years of Turbine Leadership

GENERAL ELECTRIC

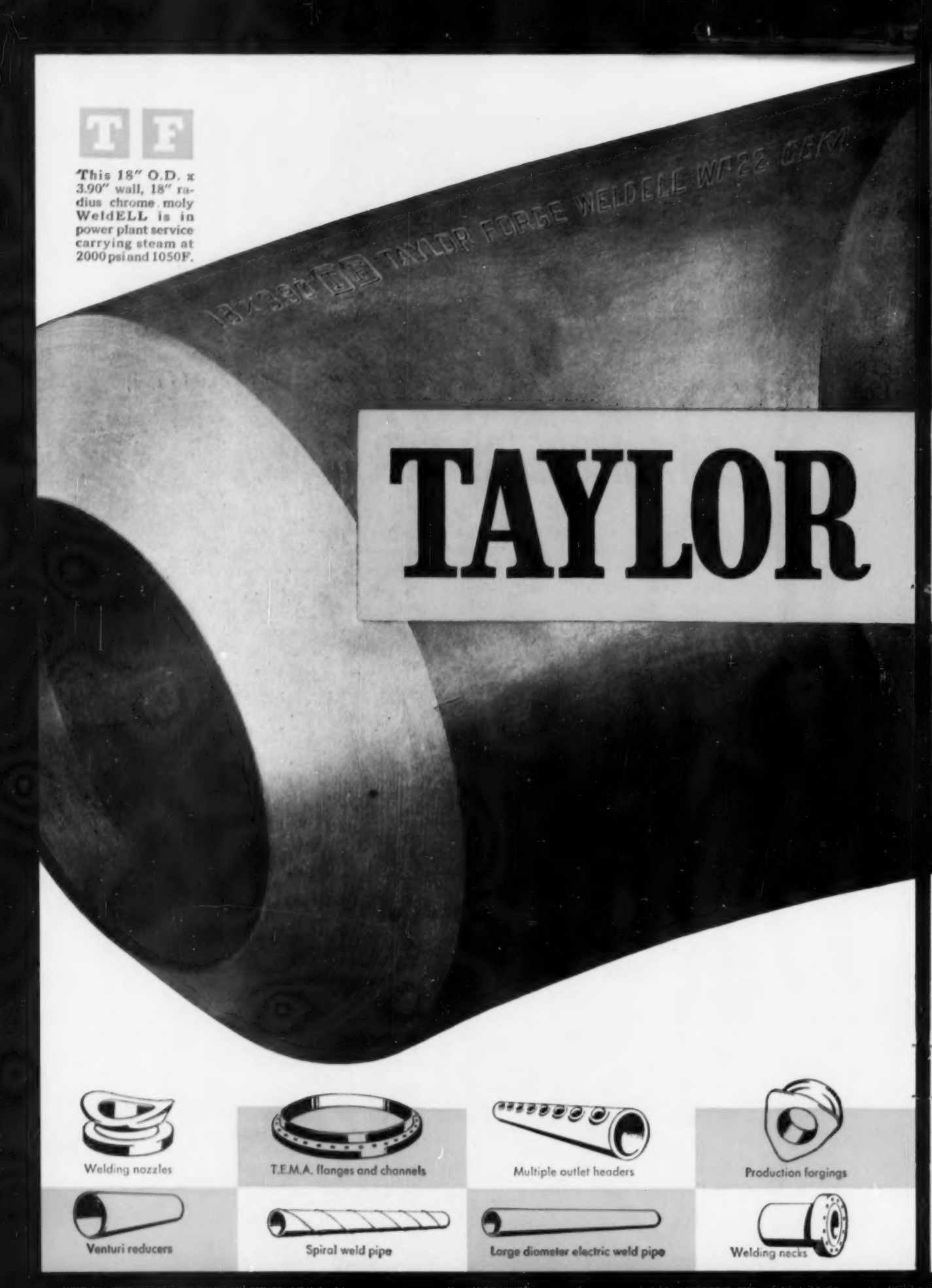


COMPLETE STATION CONTROL is handled from the four combined process-control and turbine-control panels. After preliminary manual operations, turbine comes to speed automatically.



COMPACT, FACTORY-ASSEMBLED, low-voltage switchgear, Cabinetrol* panel at Tescott station were planned by General Electric to take a minimum of space and to meet the station's individual requirements.

*Registered trade-mark, General Electric Co.


TF
This 18" O.D. x 3.90" wall, 18" radius chrome moly WeldELL is in power plant service carrying steam at 2000 psi and 1050F.
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TAYLOR
Welding nozzles
T.E.M.A. flanges and channels
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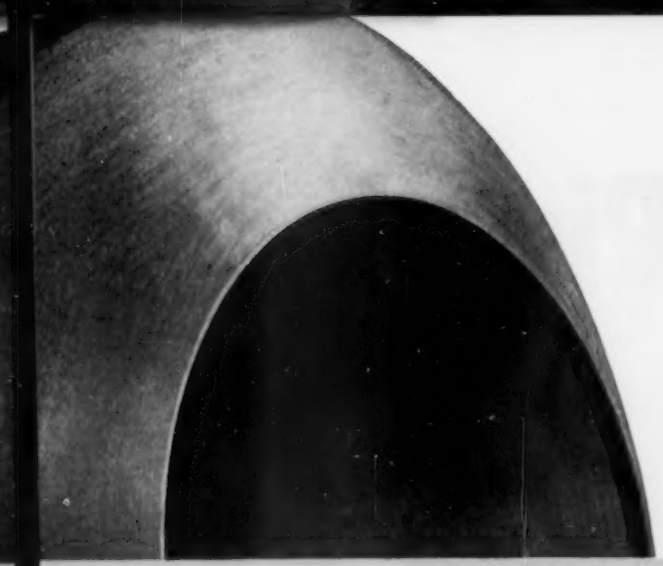

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FORGE Welding Fittings and Forged Flanges

Engineered for accuracy . . . forged for greatest strength and longest life . . . backed by the know-how that has come with 55 years of experience in the forming of metal products by hammering, rolling, extruding, drawing, pressing, welding—in fact, by every known basic metal working process.

That's why . . . by any standard of comparison . . . by any method of value analysis . . . you can't buy better products than those of TAYLOR FORGE.

For EVERYTHING in Welding Fittings and Forged Flanges . . . every type, size, thickness, pressure rating, material . . . turn to TAYLOR FORGE.

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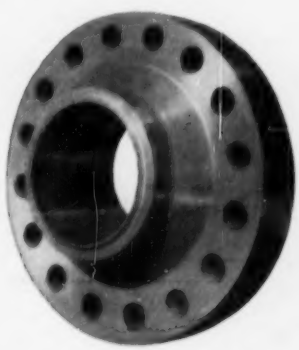
There's a Taylor Forge Distributor near you

He carries a full stock of Taylor Forge Welding Fittings and Forged Steel Flanges and can supply your needs promptly. He's a good man to know for he's exceptionally well informed on the subject of piping and through him you have available the services of Taylor Forge engineers for help and advice on any piping problems.



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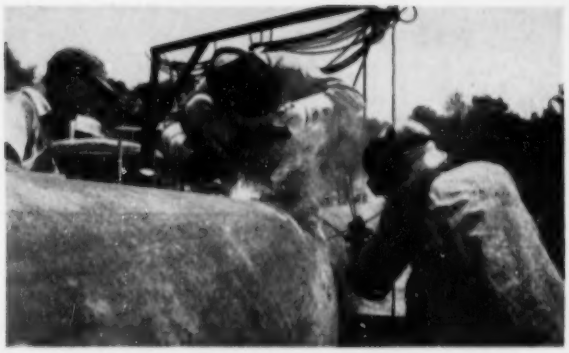
World's Widest Range of Standard Steels

in a hurry:

REPUBLIC LINE PIPE CAN SPEED YOUR JOB



FAST-MOVING WELDERS APPRECIATE THE UNIFORM DISTRIBUTION of metal in the walls of Republic Line Pipe. With no thin spots to worry about, welding can proceed at top speed without the danger of burning through the metal.

Joints can be welded rapidly, without delay. Jobs can be completed faster, with less difficulty. Laying schedules can be set, met—and often bettered.

The reason is well known among most pipeliners. It's the *consistent uniformity* in every joint of Republic Line Pipe, whether large or small in diameter.

Take Republic's big-diameter Electric Fusion Weld Line Pipe, for example. There are no delays searching for true-fitting ends. Because circumference is always constant, field joints line up quickly and accurately. The entire perimeter can be welded at top speed.

You can be certain of good welds, too. The consistently uniform wall thickness of Republic Line Pipe assures an even distribution of metal throughout the pipe wall, preventing dangerous thin spots that cause burn-throughs. The result is sure-fire dependability in every inch of the line.

These same high standards of quality hold true for Republic Electric Resistance Weld Line Pipe, too. The highly ductile steel permits smooth, uniform bends in the shop or field. And both types of pipe are ideal for building high pressure lines because of uniform high-yield strength.

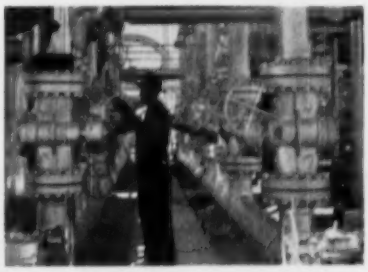
For a fast job with excellent results, specify this dependably straight line pipe. Republic makes three kinds: Electric Fusion Weld in sizes 24" through 30" O.D.; Electric Resistance Weld in sizes 2⅜" through 16" O.D.; and Continuous Butt Weld from ⅛" through 4" nominal.

Let Republic help you on your next oil or gas transmission, gathering, distribution or product line job. Call us—or send coupon for descriptive literature.

More Republic Products to Speed Your Job

REPUBLIC CHAIN SECURES 30" REPUBLIC LINE PIPE for a fast and bumpy trip to the job site. Republic's Chain Division makes a complete line of chains in a wide range of sizes for every requirement—from binding, hauling, hoisting and towing to tire chains and chain slings. Coast-to-coast warehousing assures prompt delivery.

FAST, ECONOMICAL REPAIR OF LEAKY SERVICE LINES is extremely easy with corrosion-resistant Republic Semi-Rigid Plastic Pipe. No need to ditch across lawns. Simply expose connections at main and riser, insert plastic pipe through existing service and connect. Lightweight, easy-to-handle Republic Semi-Rigid provides amazing savings.



THE RIGHT FASTENER FOR ANY JOB CAN BE SECURED FROM REPUBLIC. We make and stock over 20,000 regular items for all fastening needs. Clean, accurate threads provide maximum holding power, resistance to wear and trouble-free backoff for maintenance. Specify Republic fasteners on your next order.

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Please send me information on:
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☐ Electric Resistance Weld ☐ Electric Fusion Weld
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Republic Chain ☐ Republic Fasteners ☐
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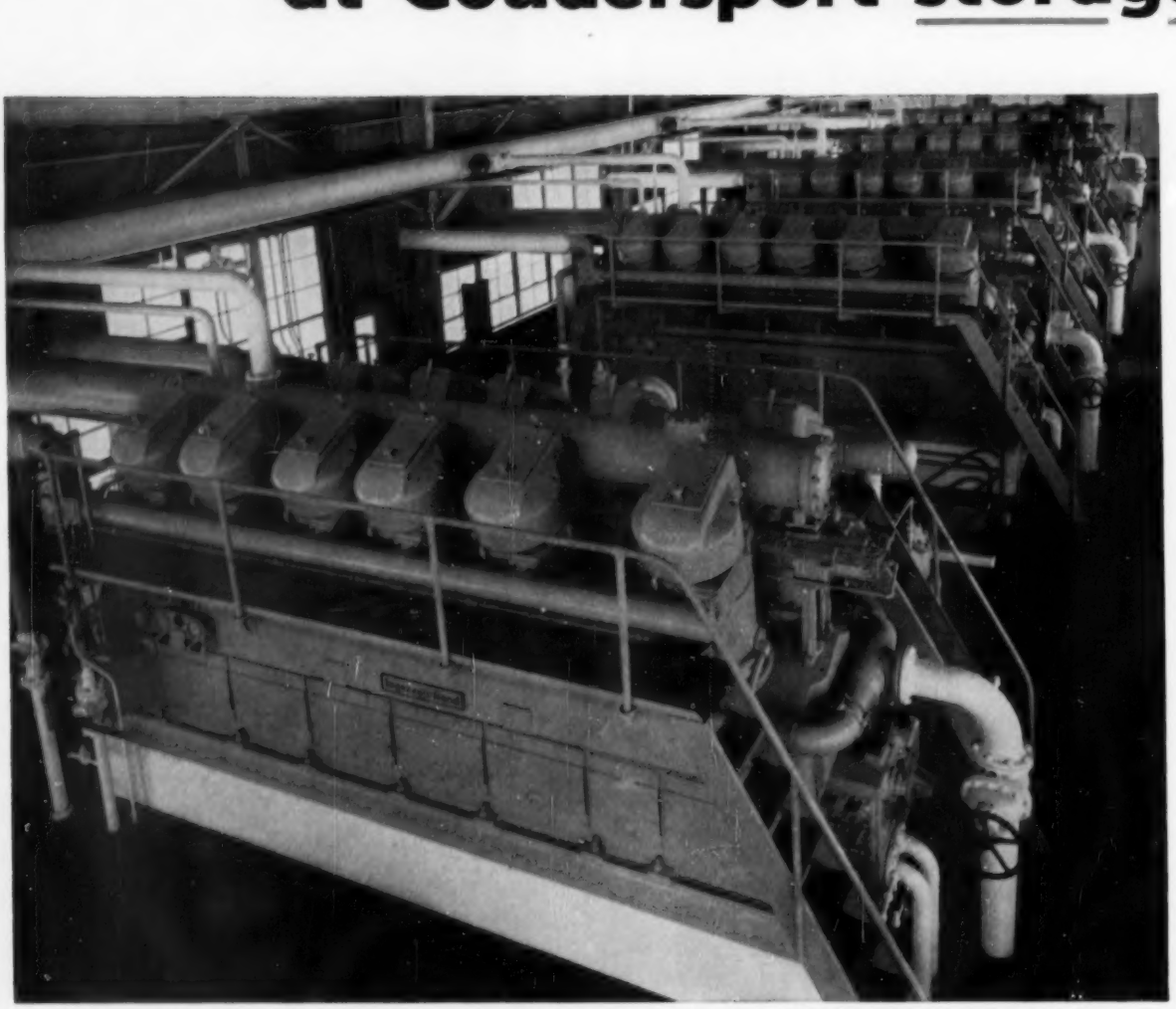
City_____ Zone____ State_____

C-1662

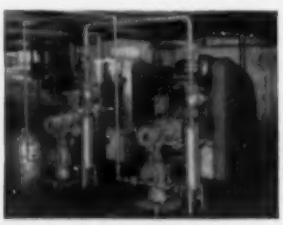
TENNESSEE GAS employs at Coudersport storage



Ingersoll-Rand KVG gas-engine compressors on natural gas storage and transmission service at Tennessee Gas Transmission Company's Coudersport (Pa.) station. Each unit is rated 1320 hp.

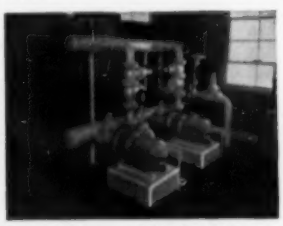
OTHER I-R EQUIPMENT AT COUDERSPORT STATION

PSVG-8 gas engine, rated 544 hp, driving a 380-kw synchronous generator for supplying plant power.



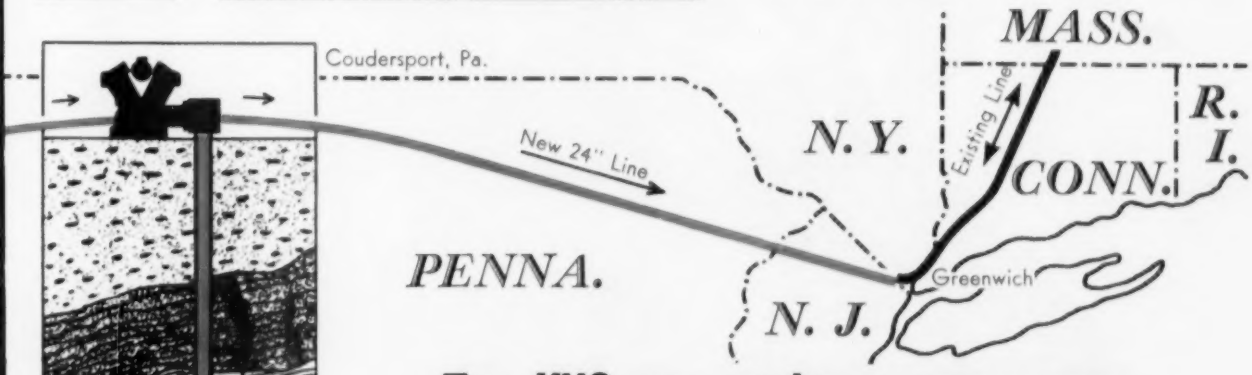
Two electric motor-driven Type ES compressors supplying 250-psi starting air for the KVG compressors.

Two Class LFV centrifugal pumps supplying jacket cooling water for the KVG's; each pump rated 2200 gpm, 60-ft. head.



Two Class RVL Motorpumps supplying jacket cooling water for the PSVG gas engine; each pump rated 312 gpm, 59-ft. head.

four-cycle flexibility and transmission station



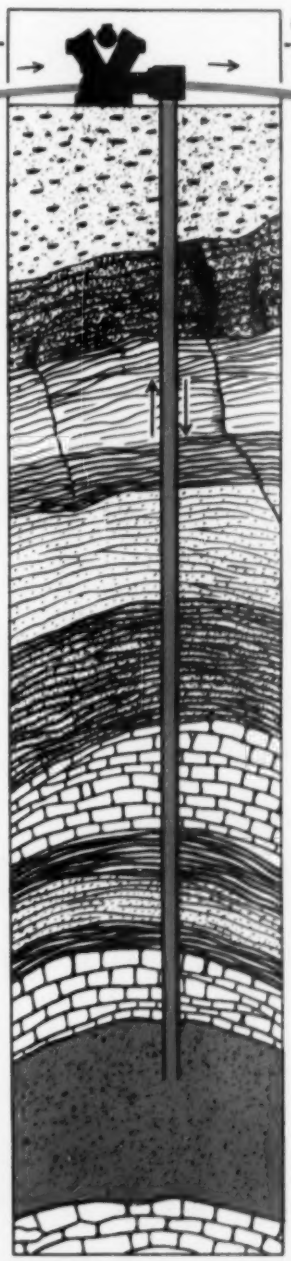
Ten KVG gas-engine compressors on unusual dual-purpose job serve New York City area

Billions of cubic feet of southwestern gas are now being inhaled by Pennsylvania's once-productive Hebron gas field, to be exhaled through a new 250-mile pipeline when winter weather swells New York City's gas needs. This new system is a part of the growth of Tennessee Gas Transmission Company, and the lungs of the system are ten Ingersoll-Rand KVG gas-engine compressors totalling 13,200 hp at TGT's Coudersport (Pa.) pipeline station.

These compressors inject the gas into the underground storage field, and later boost it through the line to the consumers. Compressors on such a double-duty job must operate over a wide range of speeds and loads — a need well met by the inherent flexibility of I-R four-cycle machines. (For example, these KVG's operate from 300 to 1600 psig intake, and 900 to 2500 psig discharge.)

These V-angle, 4-cycle units actually deliver smooth power without skipping or stalling, all the way from full load to no load, from half speed to full speed, and with generous reserve for temporary overloads. All this, plus the proven dependability and trouble-free performance of I-R compressor cylinders and valves.

For sustained top performance under the most demanding conditions, it pays to specify Ingersoll-Rand 4-cycle gas-engine compressors. Ask your I-R representative to show you how these heavy-duty units can make long-range savings in your compression costs.



Cross-section of underground storage field, where vast quantities of natural gas are injected into porous sands capped by thousands of tons of rock and shale.

Ingersoll-Rand

6-268

11 Broadway, New York 4, N. Y.

4-CYCLE

COMPRESSORS • PUMPS • AIR AND ELECTRICAL TOOLS • VACUUM EQUIPMENT • ROCK DRILLS • CONDENSERS • GAS AND DIESEL ENGINES

WHAT'S COOKING?

A "batch" of the finest steel you could possibly want—that's what's cooking.

Of course, we have many and many a "recipe" for fine steels and in this particular case it's steel for the production of YOUNGSTOWN ELECTRIC WELD LINE PIPE.

Yes, we at YOUNGSTOWN spend many hours over a "hot oven" cooking up things (mainly fine steels of course) for industry. However, unlike the cooking that Grandma used to do—with a "pinch of this" and perhaps a "dab of that"—our cooking is done strictly by the book . . . there is no guess-work about steel making at YOUNGSTOWN.

Continuous day-by-day research and development makes possible a more efficient and economical operation and naturally a finer product.

So, today, when you order Youngstown Electric Weld Line Pipe, you can be assured that you are buying more than "just pipe"—you are buying years of experience in the making of steel of the highest quality—you are buying a longer lasting, more economical product—you are buying more years of trouble-free service—you are buying YOUNGSTOWN QUALITY AND SERVICE.

QUALITY YOUNGSTOWN SERVICE

Youngstown

ELECTRIC WELD LINE PIPE

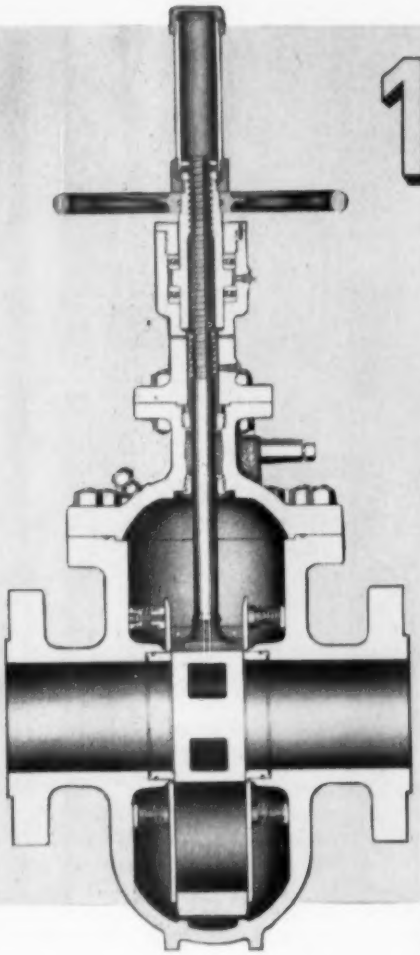
THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

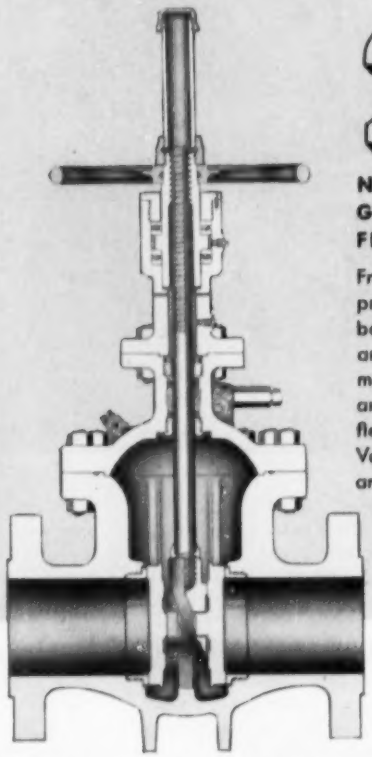
CRANE

Announces Two New PIPE LINE VALVES



1 **NEW CONDUIT-TYPE GATE VALVE ONE-PIECE DISC; NON-DIRECTIONAL FLOW**

Bottom seated, "O" ring-sealed seat rings are self-aligning, and self-sealing on closure—one-piece conduit-type disc uses line pressure for tight seating, does not need excessive stem thrust—spring loaded disc plates prevent loss of grease and entrance of line dirt into body. Sizes, 2 to 30-inch, full-way; venturi patterns also available.



2 **NEW DOUBLE DISC GATE VALVE WITH FREE-TO-ROTATE DISCS**

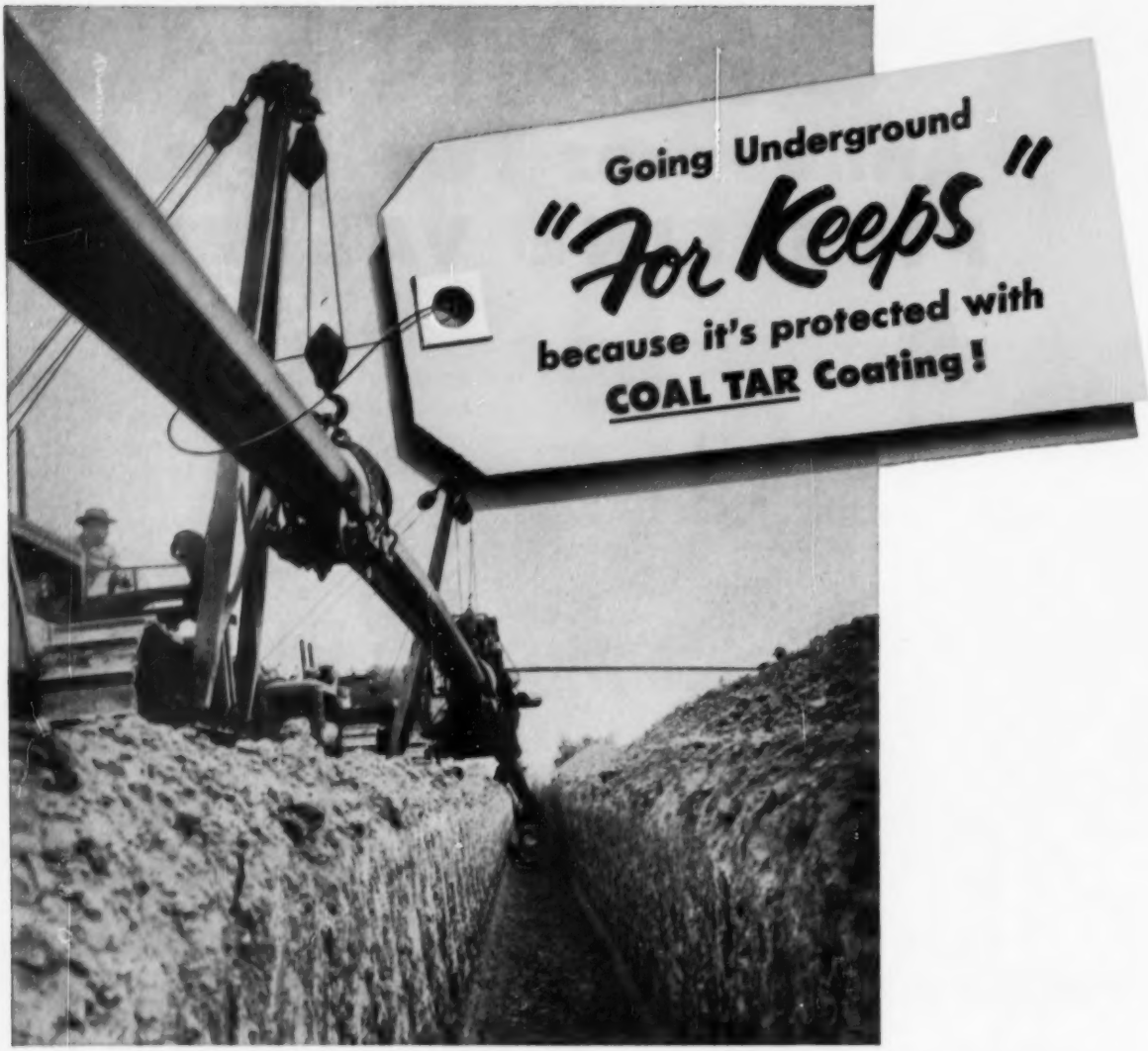
Free-to-rotate discs distribute wear, prolong life—machined guides in body accurately control disc clearances—annular wedging surfaces maintain perfect disc alignment and compensate for any body deflections imposed by line strains. Valve operation is easier, surer, and maintenance is greatly reduced. Sizes, 4 to 24-inch.

BOTH LINES OF VALVES HAVE bolted "O" ring-sealed bonnet-joint; 2-piece bonnet and yoke; fully enclosed yoke for stem thread protection and lubrication; plastic packing with injector-check valve; supporting legs cast on body; pressure relief valves.

Descriptive literature now on the press . . . reserve your copy. Write today to CRANE CO., 836 S. Michigan Ave., Chicago 5, Ill. Branches and Wholesalers serving all areas.

CRANE *Since 1855*

VALVES & FITTINGS • *PIPE* • *KITCHENS* • *PLUMBING* • *HEATING*



EACH year an overwhelming majority of pipeline owners and operators select *coal tar* coatings to protect their long-term investment. And with good reason: No other material can match coal tar coating's *proven* record of economical, long-lasting protection.

Coal tar coatings are amazingly durable. And their life is measured in decades—thanks to their inherent ability to resist soil stress and water absorption, the two big reasons why other materials fail.

If you'd like to be sure of the *best* pipeline protection that money can buy, specify *Pitt Chem* Coal Tar Coatings, just as scores of leading pipeline companies do. When you buy *Pitt Chem*, you buy *assured* pipeline protection with every drum, because *Pitt Chem* Coal Tar Coatings are manufactured to rigid, *published* specifications by a basic producer. If *you* have a pipeline protection problem, chances are we have the answer. *A phone call will place an experienced Pitt Chem man at your service.*

PITT CHEM® TAR BASE COATINGS

- Standard Grade
- Modified Grade
- Plasticized Grade
- Hotline
- Cold Applied Tar Base Coatings

PROTECTIVE COATINGS DIVISION
PITTSBURGH COKE & CHEMICAL CO.
Grant Building • Pittsburgh 19, Pa.

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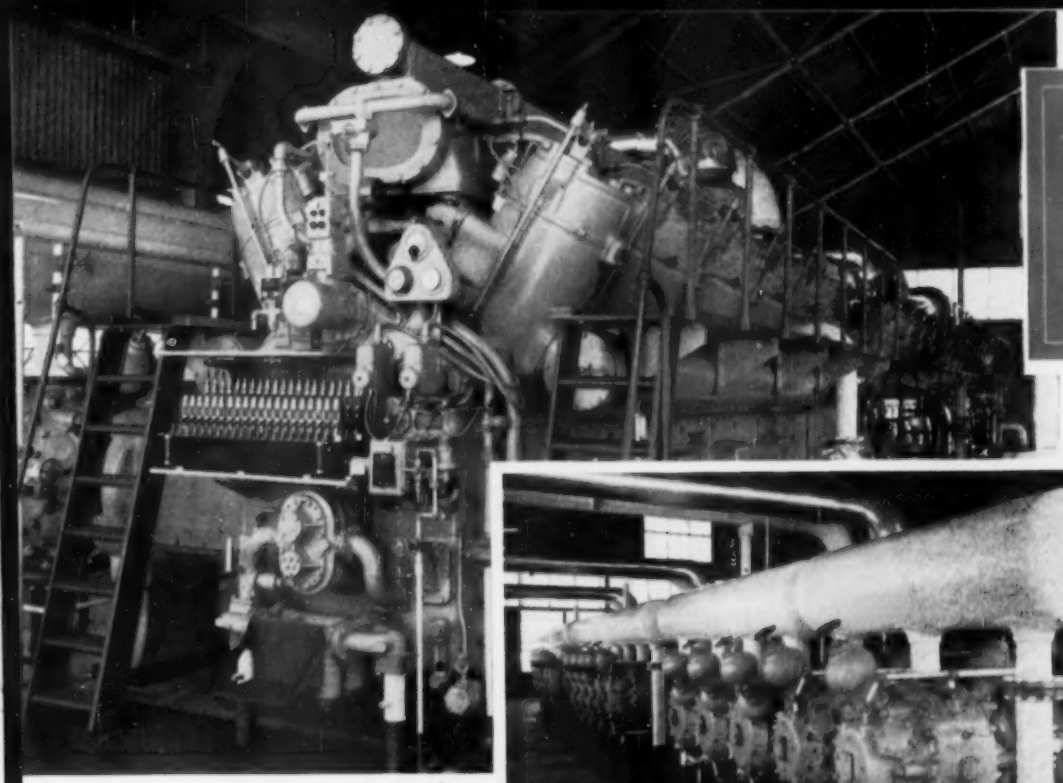
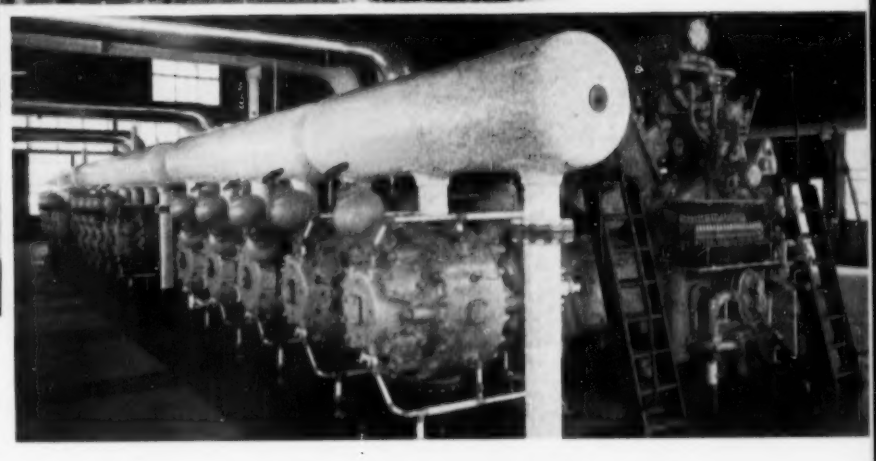
COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON



Another Example of Efficient Power at Lower Cost



Shown here are different views of the 10-cylinder Cooper-Bessemer GMVA compressors in the Pembrook Station of the El Paso Natural Gas Company. These five GMVA's, each rated 1350 hp at 300 rpm, are used in field boosting of natural gas.

10 MONEY-SAVING FACTS YOU SHOULD KNOW ABOUT NEW COOPER-BESSEMER GMVA COMPRESSORS

1. The new GMVA produces 35% more power than the original GMV; 23% more than the Turboflow type.

2. This power gain is accompanied by a full 25% reduction in fuel consumption over the original engine and 10% over that of the Turboflow type.

3. Improved fuel utilization means less heat is lost to jacket water and lube oil — more work!

4. Therefore the gain in power is obtained with no increase in exhaust temperature.

5. The improved power-to-temperature ratio reduces the demand for heat dissipation to water, permitting smaller auxiliary equipment.

6. Built-in centrifugal blowers, of Cooper-Bessemer design, provide greater scavenging air volume at low pressure for smooth, efficient performance at all loads and conditions.

7. With fewer parts, and components of improved design, the GMVA offers unmatched reliability, with minimum maintenance and part replacement.

8. Full-flow lube oil filtration assures complete protection against foreign particles and neutralizes acidity.

9. Improved design provides ample working space around power cylinders for simplified inspection and maintenance.

10. In short, minimum space per installed horsepower, with over-all economy and unexcelled performance.

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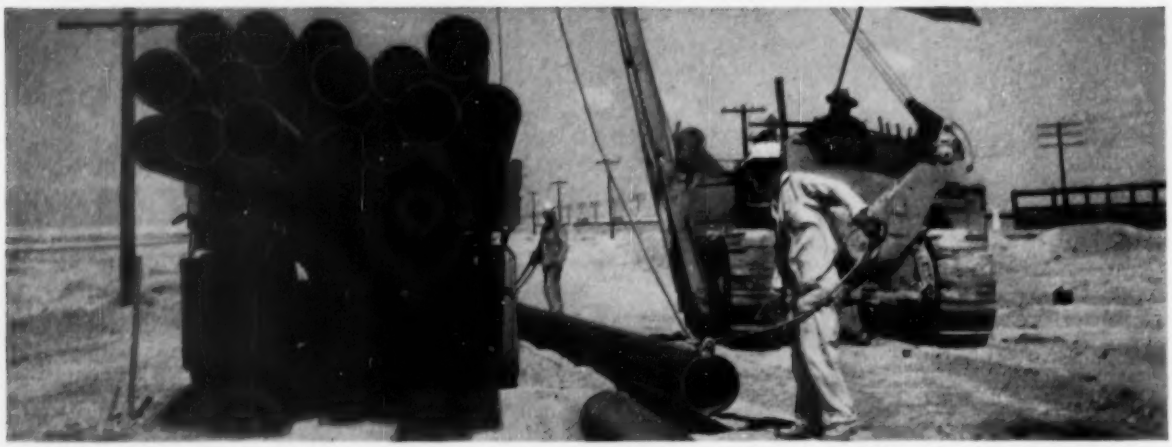
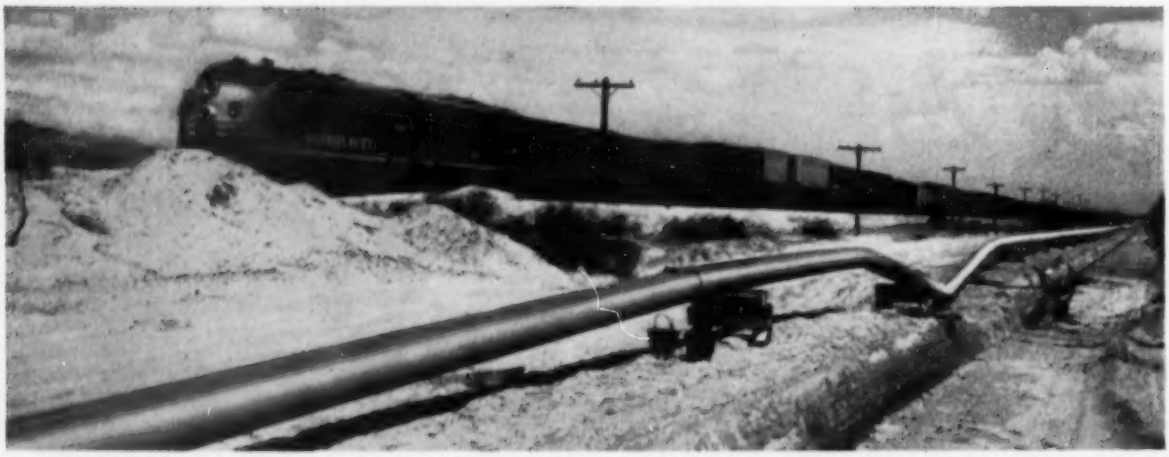
$34,000,000 Southern Pacific Pipeline



SOUTHERN PACIFIC COMPANY, one of the world's largest transportation systems, is the first railroad to build a major pipe line. The work is being done by Southern Pacific Pipe Lines, Inc.—a subsidiary. 700 miles of the 844 mile line are now completed.

is rushed to completion



PIPE LINE EXTENDS from Watson, Calif. to El Paso, Texas. Products to be moved are gasolines, diesel oil, and jet fuels. On jobs such as this Kaiser Steel line pipe must measure up to 52 rigid tests to be sure it meets every specification requirement.

SEVEN contractors are laying pipe on eight spreads to rush this first Southern Pacific pipe line to completion by January 1, 1956.

Working closely with them is Kaiser Steel, the major supplier of line pipe. Careful planning to make *sure* that top-quality pipe is available when and where it's scheduled is an important part of Kaiser Steel's service to pipeliners.

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THE DECADE SINCE THE WAR

The rapid growth of the nation's intricate network of natural gas pipelines since the war has given rise to a "maximum of new ideas, materials, and methods." This phase of the industry has shown the most spectacular development of all those discussed in this special study **(see pages 39-43).**

Pipelines nearly doubled their mileage

By J. FRED EBDON • Editor

STATISTICS are dry facts that cannot be escaped, most of the time, as much as one would usually like to. Natural Gas transmission since 1945 has developed to the point where anything other than numerical statistics is inadequate. For total natural gas transmission line mileage for the United States for the period 1945-1955; see *Table 1*.

TABLE 1 — Total transmission line mileage 1945 - 1955 —

Year	Transmission Lines, Miles	Year	Transmission Lines, Miles
1945	77,280	1951	115,120
1946	83,460	1952	118,160
1947	88,020	1953	125,330
1948	91,970	1954	134,000
1949	98,270	1955	138,000*
1950	109,360		

*Estimated figure based on certificates granted and estimates of completed mileage at the close of the year. A more accurate tabulation for 1955 will come from the AGA, FPC, etc., when final data for the year are available from construction ports.

These figures indicate that the pipeline segment of the industry nearly doubled its mileage during the Golden Decade of Pipelining—1945 on. This summary includes only mainline and connecting facilities. Field lines and gathering lines are not considered.

The capacity increase is something else again. The trend in pipelining has been toward larger diameters of pipe operated at higher and higher pressures. There is no need to state here the tremendous increase in volumes of natural gas pipelined each year during the period in review.

Most of these advances are the result of engineering and technical advances that have made them possible without financing the projects out of practicality.

For our purposes, there are two classes of pipelines: (1) the transmission system installed and operating prior to 1945, and (2) the transmission systems that have been formed and constructed since this date. It is hard to realize that some of the best known systems have only been in operation for four or five years. The new systems have been interesting operations since many of them were completely designed and installed during a relatively short period. In theory, this is the answer to the design engineer's dream. One can expect, therefore, to find a maximum of new ideas, materials, and methods in this classification.

A skilled interpreter can select the most advantageous general routing from the aerial mosaics produced by an air-borne survey. Radar has also been used for aerial surveying and profiling.

GAS

JANUARY 1956

Surveying progress

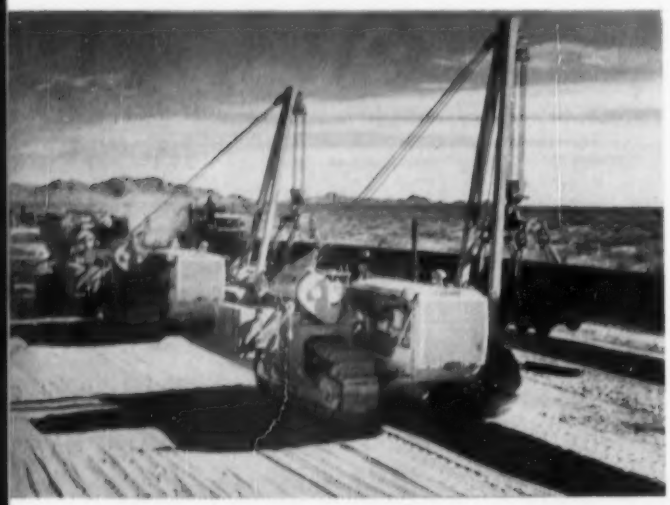
Starting with the surveying methods, there have been many technical advances. Ground parties used to do the bulk of the preliminary right-of-way surveying. Since the war, cloud jumping in aircraft fitted with a king-sized aerial camera has generally replaced the civil engineering ground party on the survey to select the most practical route. Stereoscopic viewers and other more complicated instruments allow a skilled interpreter to select the most advantageous general routing from the aerial mosaics produced by the airborne survey. Radar has also been used for aerial surveying and profiling.

Joints

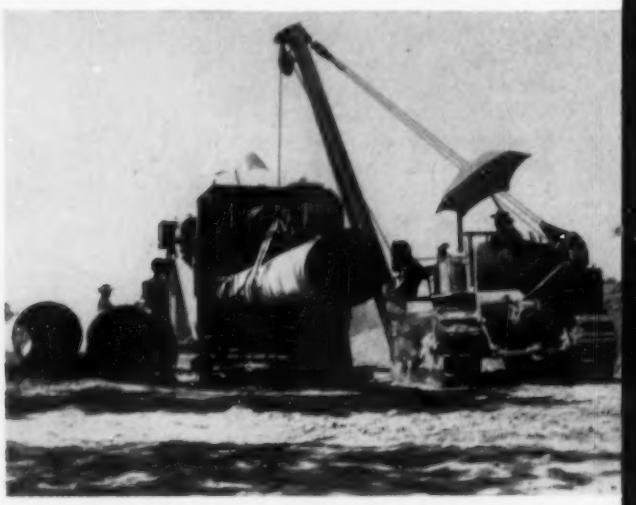
The threaded and coupled joint was well on its way out of the design for cross-country gas pipelines by 1945, but some were still being considered and possibly installed. It is doubtful if any thought of such practice would be considered today for the same application. We have seen the pipe-laying machine (remember the Buckeye and California types?) replaced by the welding generators on the firing lines of today's major pipelining projects. Many improvements in welding generator sets, electrode design, and techniques have been made to keep pace with the improvements in spread efficiency and the tendency toward high-chemistry steel for basic line pipe material.

units have been made larger and larger as pipe diameters (and weights) have increased. Auxiliaries for the crawler tractor have enabled it do more and more of the work on the pipeline and its right-of-way. Trucks, trenchers, backhoes, trailers, etc., have likewise been increased in size and capacity to handle larger and heavier pipe in more rugged work areas.

Bending has undergone a real revolution since World War II. Prior to that time the diameters were relatively small and the wall thickness relatively thick. With the improvements of pipe material physical characteristics and production methods the problem of making bends without buckling the large dia-



"The basic pipelining tool, the crawler tractor with side-boom pipe layer, has had some evolution. Generally, these units have been made larger and larger as pipe diameters and weights have increased."



"Bending has undergone a real revolution since World War II. The vertical bending machine is tending to displace the horizontal type. Prior to that time the diameters were relatively small."

Ground survey parties then lay out the specific route and stake out the line. There is little need to detail the rapid advances made in their instrumentation now that electronics, radar, radio, and improved optical systems are with us. So, the civil engineer and his field parties have not been replaced since the war, just vastly supplemented.

Diameters

The pipelines as installed today as compared with pre-1945 lines are generally of larger diameter. Now, 30-in., 34-in., and 36-in. OD pipe is considered "big-inch" for transmission lines. Then, 16-in., 20-in., 24-in., and 26-in OD was pretty big, and they are still big, but the concept of really big has changed.

Installation techniques

Many lines used to be stove-piped before and just after the war. The firing line method has replaced this except that one company has used it recently for welding some 36-in. OD pipe and it probably has been used off and on, but not to any great extent, by others.

The changes in basic pipelining equipment have been many. ROW clearing is now done with power equipment more than prior to 1945 and many specialized devices have been evolved.

The basic pipelining tool, the crawler tractor with side-boom pipe layer, has had some evolution. Generally, these

meter, "thin wall" pipe faced the pipeliners and their contractors. The wrinkle ending machines were developed and used. The subsequent invention and use of "stretch" bending machines have produced a technique that makes a more desirable type of bend. The stretch bend is almost exclusively used in current pipeline construction. The vertical bending machine is tending to displace the horizontal type. The 30-in. OD-and-up pipelines became practical with the development of the new bending machines and techniques.

Lining-up line pipe for welding has been made more efficient by the improvement in line-up clamps. The internal line-up clamps used on major pipelines today are highly improved mechanisms and are usually "automatically" operated by an electric motor,

or hydraulic pneumatic system.

Welding has enjoyed vast development during the period. For pipelines, electric welding was more widely used than was oxy-acetylene even before 1945. Semi-automatic pressure welding was new in 1945. Part of this development was influenced by the unavailability of electric welding sets and welding rods during the war years. This technique called for welding pressures in the neighorhood of 3000 to 4000 psig and temperatures in the range of 2100 to 2500° F. Hydraulic pumps acting through hydraulic cylinders furnished the pressure. The hydraulic equipment was mounted on a crawler tractor and powered by an auxiliary drive from the tail shaft. Welding heat was supplied from water cooled,oxy-acetylene welding heads positioned so as to impinge simultaneously about the entire periphery of the point. The circulating cooling water was supplied from a pump driven from the mentioned auxiliary drive. Proponents of the system described savings by reducing welding crews from 50 to 300% and auxiliary equipment from 20 to 300%, depending on the size of the pipe to be welded, but the method has been overpowered in pipelining by the shielded metal-arc welding process.

The welding processes used and the welding inspection methods have all undergone changes that have led to improvements during 1945-1955. The efforts of the pipeline companies to produce better welds and detect faulty welds have been the impetus to the progress. As in the cases of other progress in pipelining, it has been mainly a matter of improving equipment and techniques rather than revolutionary new concepts.

The same is true of coating and wrapping materials, and holiday detecting devices. They were known and used prior to 1945, but they have progressed rapidly since the end of the war. Special coatings for river crossings, lines laid in swamps, etc., have been developed. Methods for application of all coatings have been improved. The use of coatings and particularly specialized coatings has been recognized as one of the most important phases of pipeline engineering. Most of this recognition was accomplished after the start of the past decade.

Automatic valve operators were not new in 1945. They were in use at compressor stations of the day, but their use has spread in the last 10 years. In general, remote measuring, telemetering and remote and automatic control have moved from being special or unusual installations to routine considerations. Pipelining has been in the transition from manual to automatic operation. We are still a long way from the completely automatic pipeline, but automatic devices are trusted more these days and many control loops are being closed. Much consideration and design are being expended in the direction of automatic and closer control. Communications improvements have added drive to this trend. New equipment and devices for more automatic and closer control systems are announced to the industry nearly every day.

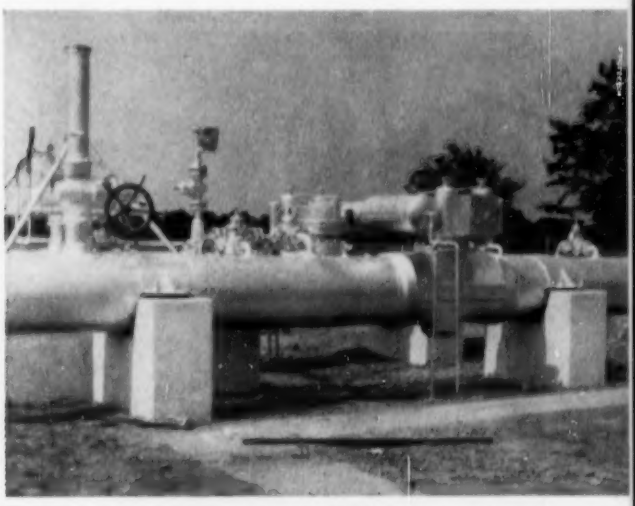
Compressor stations

Compressor stations built in 1944-45 do not look a great deal different from those today. The one exception to the previous statement is the use of turbine-and engine-driven centrifugal compressor units. Turbines were being discussed extensively back in 1945. They were being called the power plant of the future.

Centrifugal compressors were not new in 1945. They had been around for years, but they were new for compressing gas in transmission lines. During the decade they have been moving into gas pipelining applications. Stations are now recently completed to test the parcticality of using centrifugals driven by gas engines for really automatic compressor stations. Numerous installations of centrifugal compressors driven by combustion gas turbines have been made and adequately publicized since 1945.

The first major application of a combustion gas turbine as a prime power unit for a natural gas pipeline compressor station was made on September 9,1952. Since then, the gas industry has been using them more and more each year. They have generally been used in booster stations spaced between reciprocating engine-powered stations

"Special coatings for river crossings, lines laid in swamps, etc., have been developed and methods for application of all coatings have been improved."



"Automatic valve operators were not new in 1945. They were in use at compressor stations of the day, but their use has spread in the last 10 years."

as loads have increased on existing systems. Their advantages depend on the situation, so it is unlikely that they will, in their present stage of development, replace the reciprocators, but the turbine is here to stay and has been accepted by the pipeline industry as a device that may be used a great deal after long-term experinece proves them out. The relatively short-term experience to date makes the turbine's future in the gas industry look very good.

Reciprocating engines for gas compression have been improved materially in the past decade. One of the most important developments took place in a transition period that extended from the late thirties into the early forties. This was the application of supercharging to four-cycle oil diesel engines. The benefits were: 35 to 50% increased engine output, 15 to 20% better fuel consumption, at least a third more horsepower hours per gallon of lubricating oil, and substantial reduction in foundation requirements and building space.

Dual-fuel diesel engines for low pressure gas injection followed closely the application of supercharging to oil diesels. The successful application of supercharging to low-compression spark-ignition gas engines was experienced about this time. High pressure supercharging or turbocharging followed as have numerous improvements in piston design, valve operation, bearing design, etc. The high-compression spark ignition engines with compression ratios in the order of 8.5 and 12 to 1 have come into use in the gas industry during the decade.

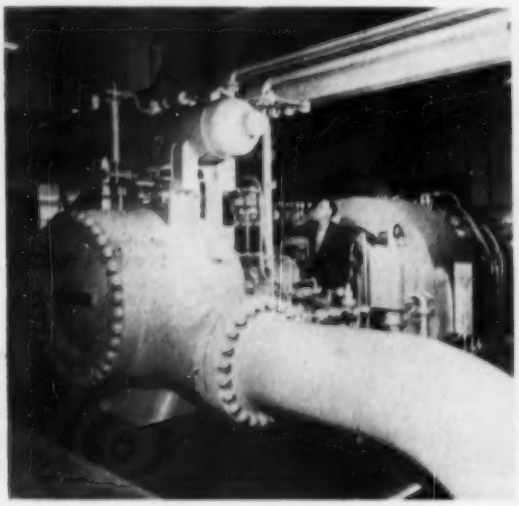
High temperature cooling for compressor engines came into use during the late forties and early fifties. Some companies have used it and found it advantageous while others have not cared to utilize the method.

Generally, the reciprocaters we work with in gas compressor stations today are high-speed, high compression. They have come a long way since 1945 and their manufacturers are constantly working to produce further improvements.

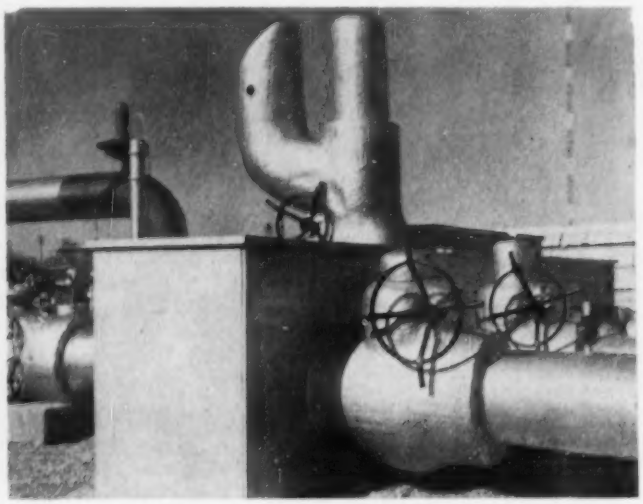
Compressor stations have been the scene of much research and development by transmission companies and manufacturers. The auxiliaries have been continuously improved. Control systems and components; alarm systems; remote control devices and circuits; lighting plants; fuel processing systems; noise elimination; vibration dampening; cooling systems and components; etc, have all been highly improved since 1945. Water treatment methods and processes have received a lot of attention and this has paid off. Corrosion prevention around compressor stations has progressed similarly. The air-cooled unit for cooling water was gaining large-scale acceptance about 1945 and has increased a trend to it since.

Research activities

Several natural gas transmission companies have initiated their own programs for basic research during the last 10 years. Completely new laboratory buildings to house the facilities have been created and research staffs formed. This is in line with the policy of the industrial might of the United States to spend money to learn how to improve products and operations. From these facilities and the gas industry-sponsored projects at research organizations maintained by foundations, universities, etc., have come formulae tables, and other engineering data about the behavior of gases and how to efficiently transport them. Much of these data that were not available prior to 1945 are currently taken for granted.



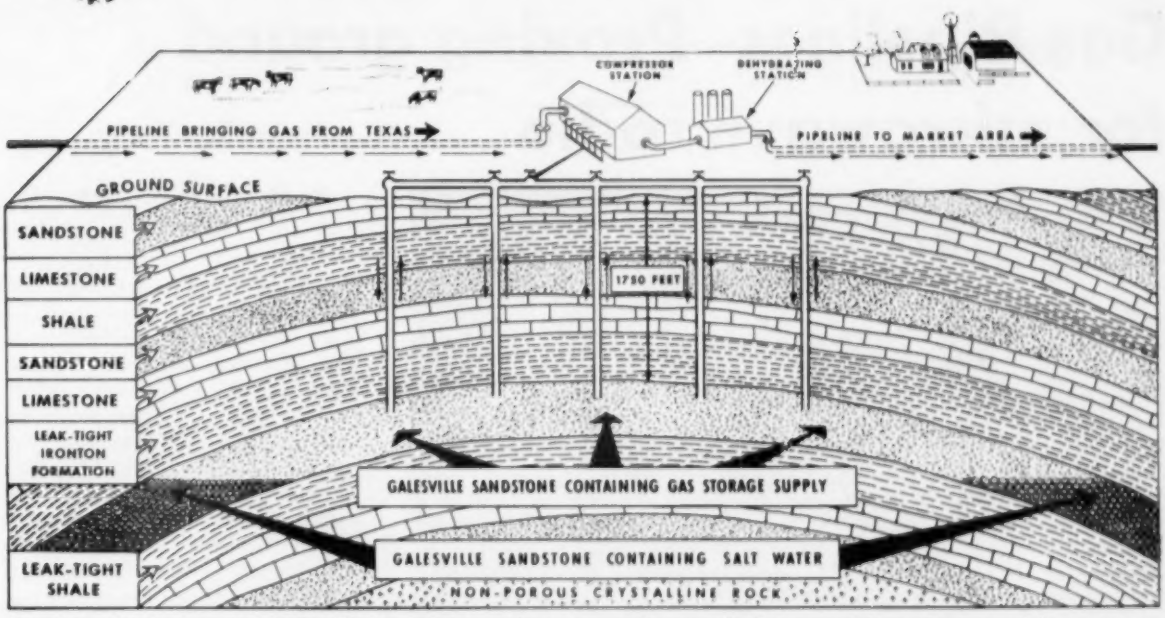
"Centrifugal compressors were not new in 1945. But during the decade they have been moving in to gas pipelining applications."



"Compressor stations have been the scene of much research and development by transmission companies and manufacturers. Noise elimination has been highly improved since 1945."

Conclusions

Pipelining has made a lot of progress during the decade—the era of the long distance transmission line was born—but with the exception of improvements of equipment and mechanisms, the basic engineering considerations in pipelining have not undergone much change. Many ideas have come of age during the era, but few radically new concepts have been developed. Specialized techniques and equipment are the most outstanding development in pipelining during the last 10 years. ■



"One interesting development of the last 10 years in underground storage operations was the first successful use of water sand for natural gas storage."

Underground storage has made possible a substantial growth in peak loads since 1945

THE use of existing petroleum or natural gas reservoirs for the underground storage of natural gas is not new to the decade since the war. In fact, underground storage of natural gas goes back to 1915. Since 1945, however, there has been a distinct trend toward increased usage of depleted reservoirs as gas storage media. This has resulted from the increasing difficulty in equating the supply of, and demand for, natural gas with the ever increasing demand from increasing domestic consumers for space heating gas during the coldest weather.

The gas storage reservoir is the tailor-made answer to pipeline load factor problems during the summer months. Seemingly, the only other answer is dumping gas for boiler fuel to interruptible customers—not a very profitable venture in most cases. There has been a lot of work in the distribution companies to produce an air conditioning load that will help them and their supplying pipelines, but during our subject 10 years, the increase in this load has not materially smoothed out the valleys of the load curves for many companies.

The statistics for underground storage are available through 1954. They speak for themselves. At the start of 1945, there were 50 underground storage projects in operation in all states. The estimated ultimate capacity of these reservoirs was 135 billion cu ft. At the end of 1954, the total number of projects had increased to 172 located in 17 states. The storage capacity increased to an overwhelming 1859 billion cu ft. Many fields are still in the development stage and their ultimate capacity hasn't been reached or, in some cases, early estimates have had to be increased. New fields are being developed, too. More companies are investigating the feasibility of storing gas in reservoirs at or near their market areas.

The development of a storage field to ultimate capacity is a slow, gradual process that will continue to improve the ultimate storage volume as time goes by. For instance in spite of the estimated ultimate capacity at the end of 1954 of 1859 billion cu ft, the total gas in storage reservoirs was 1,281,310 MMcf. This latter figure is broken down as follows:

Native gas	317,433 MMcf
Injected gas	499,231 MMcf
Working gas	464,646 MMcf

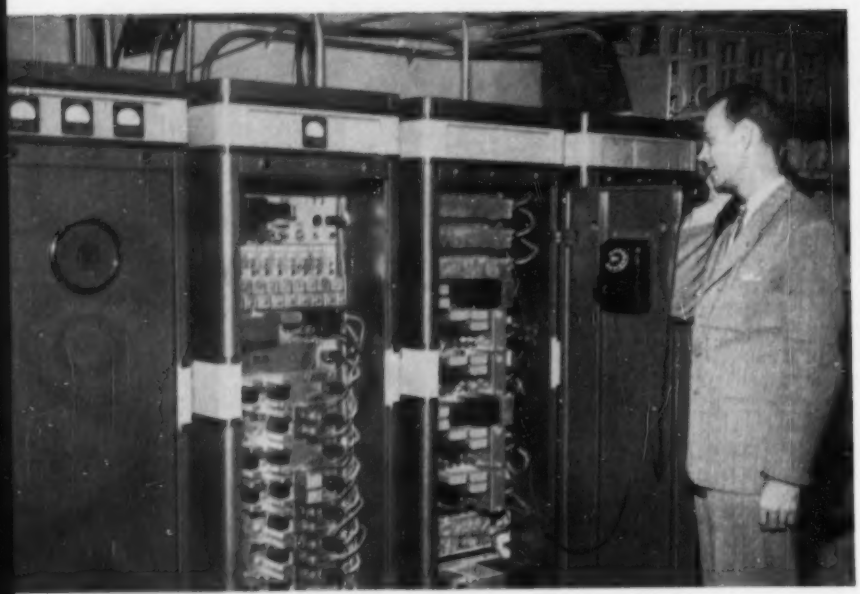
During the same year, injection exceeded withdrawals by 128 MMcf. The warm winter experienced had its effect on this datum, but it also indicates that there might be a need to increase reservoir pressures to produce the most efficient operation.

One interesting development of the last 10 years in underground storage operations was the first successful use of sand for natural gas storage (See "Herscher: First Use of Water Sand for Natural Gas Storage," GAS-August 1955, pp 107-115).

Underground storage facilities—storage volumes, wells, installed horsepower in compressor stations, etc.,—are increasing each year. It is certainly one of the major trends to develop since 1945. ■

THE DECADE SINCE THE WAR

Gas Pipelines—Proving ground for microwave radio



"New and more efficient methods of multiplexing have already increased the load factor of microwave circuits far beyond the dreams of engineers a few short years ago."

"In some gas pipeline systems, the dispatcher receives telemetered information as to pressures, flow, and input quantities into the pipeline and delivered quantities from the pipeline to consumers."

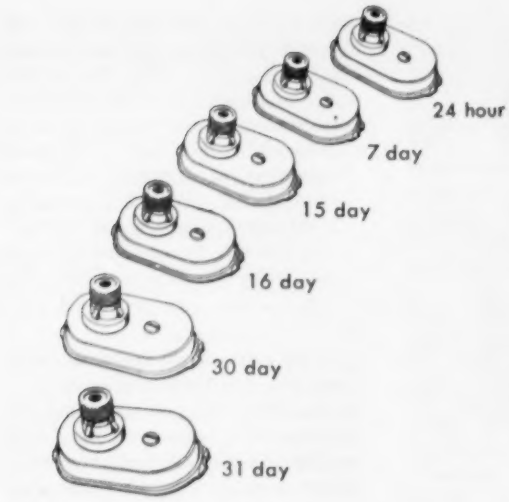
By **FRANK M. CHAPMAN**
Publisher

OF all the many techniques used in the operation and maintenance of a cross-country gas pipeline, microwave communication is the only one which has come into existance and assumed a position of major proportion in the "decade since the war." Its rise to become an almost indispensable arm of gas pipeline operations is a truly fabulous story—and one not at all void of technical and financial headaches for user and manufacturer alike.

Microwave radio communication came into its own during the last war when tremendous strides were made in the development of high frequency radio techniques, principally radar. These developments were hastened by the intensive research carried on by both the government and private industry. During and following this period, a few relatively short-length microwave systems came out of the laboratories as the first microwave communication links available for industry use.

By this time, the big cross-country gas pipelines were experiencing an unprecedented demand on their facilities to supply natural gas to the fuel-hungry sections of the east, middle west and far west. Continous welding techniques had made possible the high pressure transmission of natural gas and continually higher volumes were pushed through the lines. In addition, as other new lines came into existence, the country's complex network of transmission lines began to develop.

Faced with these developments the industry started casting about for a suitable form of communication that would provide the pipelines with a closely integrated system of communication. There was a need to provide closer coordination between all operating functions, not alone in the interest



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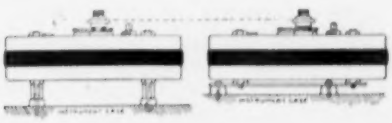

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Microwave radio...Radio communication is no stranger to the gas industry

of a more efficient operation, but also because of the complex regulatory functions with which the industry was faced. Also, there was the trend toward wider and wider use of remote indicating and control functions which required communication facilities closely associated with the pipelines, both from an operational and a physical point of view.

Radio communication is no stranger to the gas industry. One of the first uses found for the radio, in the early twenties when the tchnique was still in its infancy, was in the prospecting for and the production of petroleum products. During this early time, operators often found radio to be the sole means of communication between isolated march, water, and swamp areas and their dry land bases several miles away. This early-day use of radio was far different from its present-day application in the industry. Early-day radio operated on low frequency radiation which was usable only up to a few miles. Equipment was bulky, indispensable and expensive. Many of the men who have been responsible for the growth of pipeline communication up to and including present day microwave techniques remember only too well these early days of industry radio.

The long gas transmission pipelines supplied an almost perfect atmosphere for the growth of microwave. Since gas is a fuel that is not readily adaptable to conventional storage methods, controlled stream flow must be utilized to accommodate varying demand. Pipeline pressures, as well as pumping rates, must be skillfully manipulated to insure deliverability consistent with public requirements. The most important factor in controlled flow is a reliable communication system. Skilled dispatchers must watch demand along the system, varying gas intake from numerous well heads to accommodate fluctuations, and in many instances, interrupting supply to less critical users in order to prevent hardships from developing in areas where rapid temperature drops suddenly increase demands. Load changes require immediate order transmittals to all stations along a gas pipeline system, since load changes in one area are quickly reflected in other sections.

To insure a maximum throughout, flow pressures are maintained at highest values consistent with safe operating practices. Very often major loads are interrupted, which requires quick reduction in pumping rate or a diversion of the load to other consumers to prevent pipeline pressures from exceeding safe operating levels. .

In some gas pipeline systems, the dispatcher receives telemetered information as to pressures, flow, and input quantities into the pipeline and delivered quantities from the pipeline to consumers. With this system of operation, the dispatcher continuously observes line conditions and, when system changes are required, uses remote control devices, which function over communication facilities to effect the desired changes or utilizes voice channels to issue the required orders.

On gas pipeline systems delivering appreciable quantities over long distances, flow must be maintained by installing and operating repressuring stations. The average repressuring point is highly mechanized and kept in good operating condition so that flow can be maintained. All machinery and equipment failures are reported immediately to headquarters. These operations require adequate and reliable communications during normal operating conditions. Then breakdowns and emergencies occur at these plants, the demands on communications facilities are greatly increased.

The task of providing a suitable communication medium for these operations has been taken over during the past decade by microwave. The full impact of the rapid rise of microwave is evidenced in the fact that even as late as 1948 there were still no suitable microwave facilities available to the industry. Sensing the petroleum industry's need for radio spectrum, the FCC as late as 1944 issued an allocation of frequencies which ranged from 25 megacycles to a maximum of 162 megacycles. By comparison, the microwave frequencies, which came into use only five years later and are finding such wide use at the present time, range from 1000 megacycles upward.

The gas industry and its radio equipment suppliers are to be given very great credit for the pioneering spirit shown in putting microwave to use on the gas pipelines. The placing into operation of practically untested equipment, operating at frequencies higher than any heretofore used in industrial communication, demanded a sincere attempt to find a suitable communication medium for the long gas pipelines. Credit for this accomplishment must be shared by the equipment manufacturers, the gas pipeliners and their staffs.

In the early microwave installations, each was a development project in which both the purchaser and the manufacturer invested money and engineering talents to determine something of the new tecnhiques propagation characteristics, the electrical and mechanical tolerances that were required for dependable operation, tube and component life and the myriad of other vital factors that could only be estimated on the basis of laboratory tests. These problems have still not all been solved by any means, but the last seven have provided volumes of practical operating information.

Before microwave, the long gas pipelines used low frequency radio, and wire lines for communication between stations, with crews in the field and for their other communication requirements. In these days, the only existing facilities were a voice channel and some derived telegraph.

At the present time microwave systems are in use which provide an almost unlimited number of communication channels. In addition, the bandwidth requirements of the modern microwave systems are considerably less than the earlier models, now five or six years old. Last summer's two-day facsimile test carried out over Texas Illinois' 1000-mile pipeline microwave circuit was evidence of the present day reliability of microwave. In some 14 hours of continuous operation not a single moment's outage was recorded.

The past decade has seen the establishment of the Petroleum Radio Service as a part of the FCC's Industrial Radio Service. The same period has seen the organization and development of a number of groups and committees interested in the advancement of various phases of petroleum communication services.

On July 1, 1949, the FCC established the Petroleum Radio Service and thereby made possible, for the first time, a coordinated, long range expansion of

this branch of the service to meet the ever broadening needs of the industry. Prior to this time, the board of directors of the API had authorized the organization of a Central Committee on Radio Facilities and in November 1947 the first permanent committee was formed.

With the establishment of the new Petroleum Radio Service it became necessary to devise some method of statisfactorily administering the frequencies made available to the industry. It was for this purpose that the National Petroleum Radio Frequency Coordinating Association was formed in May 1949. In addition to coordinating frequency problems among petroleum users, the association maintains close contact with other radio users in the Industrial Radio services and cooperates with them on all matters of mutual interest.

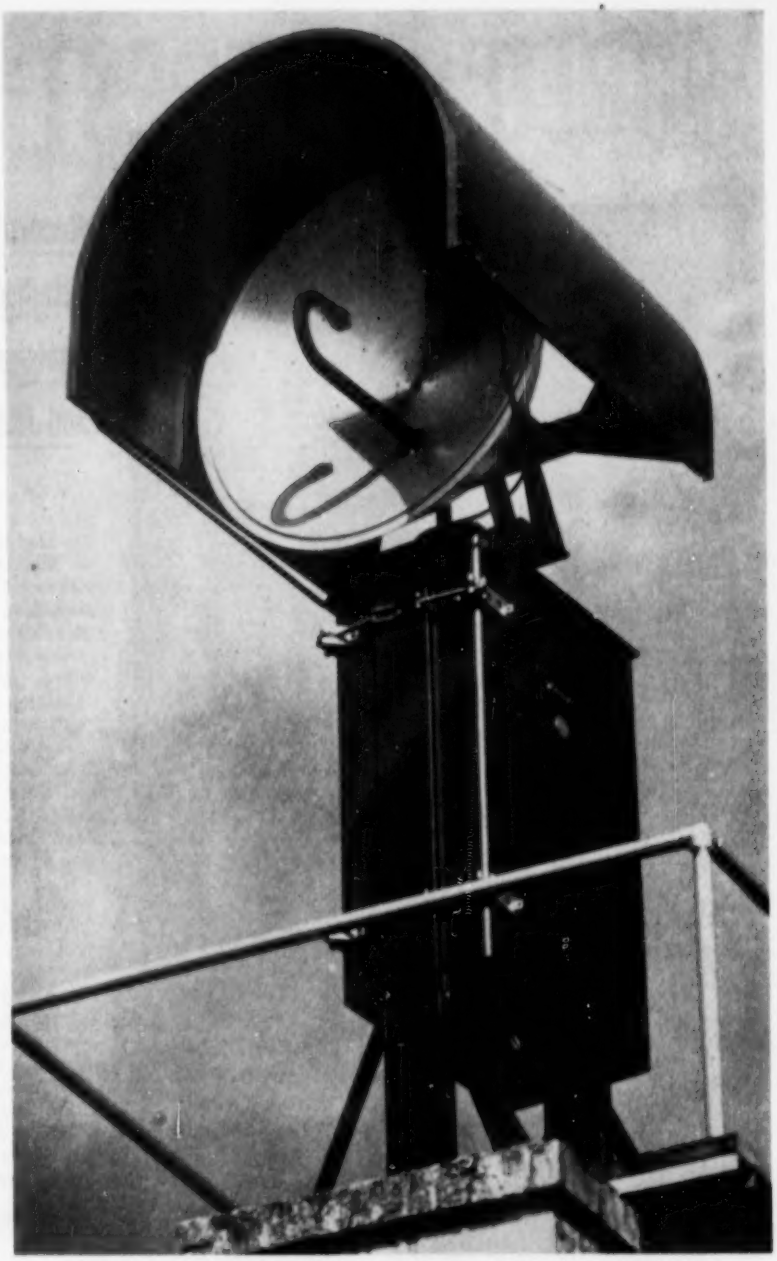
In the interest of coordinating microwave frequencies on an industry-wide basis, the NPRFCA and the Central Committee were instrumental in setting up groups for this job as early as 1952. The first group, known as the Microwave Frequency Coordinating Association, was conceived by the NPRFCA in June 1952. In early 1954 this group gave way to the newly formed Microwave Users Council, and late the same year the name of the group was changed to the Operational Fixed Microwave Council.

There is a great deal that could be said with regard to the future of microwave, or whatever new technique might be used in its place, for gas pipeline communications. Whatever the medium used, it is certain that the next decade will see a rapid growth in the use of telemetering, remote control, instrumentation and other similar techniques.

As the state of the art advances, higher and higher frequencies will certainly be used. Even now engineers are looking to the frequencies in the vicinity of 18,000 megacycles. New and more efficient methods of multiplexing have already increased the load factor of microwave circuits far beyond the dreams of engineers a short few years ago, and it is folly to attempt to predict what new techniques for multiplexing might become commonplace in the next decade.

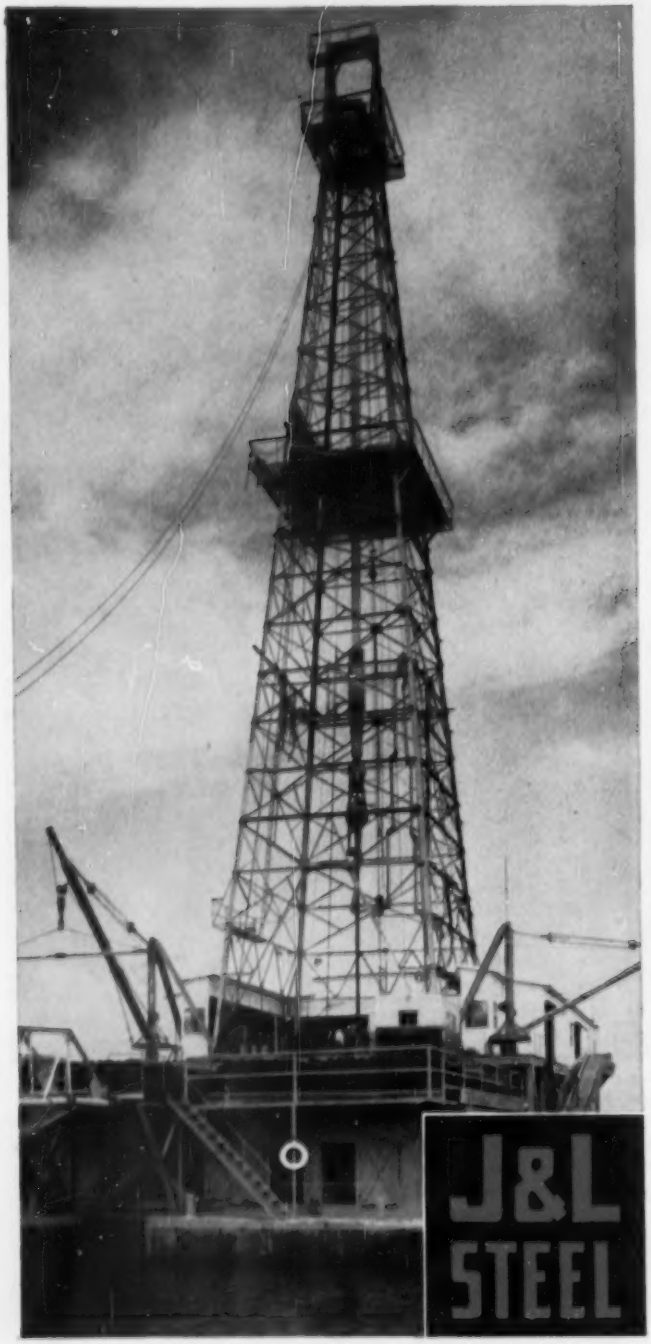
Certain to form a part in the future of pipeline communications is the new long range communication technique utilizing radio propagation by what is known as VHF ionospheric scatter. The new mode of communication is capable of reliably maintaining, reportedly for well over 90% of the time, communication over distances from 600 to 1400 miles in the frequency range of 25 to 60 megacycles. The new method is considered more reliable than the presently used high frequency circuits, particularly in the northern latitudes. Transmissions are made at frequencies above the normal, ionospheric maximum-usable frequencies and may be used for voice or teletype operation. The ionospheric signal, enhanced during years of magnetic and sudden ionspheric disturbances, is not subject to radio blackouts for extended periods of time as are regular high frequency circuits.

Just as great strides have been taken in microwave communication over the past decade so we can expect even greater achievements in the 10 years to come. ■



"The long gas transmission pipelines supplied an almost perfect atmosphere for the growth of microwave."

WORLD'S DEEPEST OIL WELL!



Richardson & Bass Drilling Rig No. 25 at well known as Richardson & Bass (Louisiana Account)—John W. Mecom —Freeport Sulphur Company—Humble-Louisiana Land & Exploration—State Lease 2414, No. 1-L. Rig and boilers are mounted on two huge barges sunk to bottom of marsh to provide firm foundation for operations.

Record depth of over four miles attained in Richardson & Bass Louisiana Well using J&L Drill Pipe and J&L Wire Rope exclusively

Wednesday, November 9, 1955, marked another milestone in the spectacular history of the oil industry. On that day, Richardson & Bass and their associates in this enterprise, John W. Mecom and Freeport Sulphur Company, broke the world's record for deep drilling in their well in Plaquemines Parish, Louisiana, 35 miles southeast of New Orleans.

This well, now more than four miles deep, has penetrated the earth to depths never before explored. Pressures are being encountered to which drill pipe never before has been subjected.

In discussing this new world's record well, J. E. (Ed) Hill, General Manager of Richardson & Bass Drilling and Producing Interests, said: "This well has been drilled from the surface to its total depth without a single pipe failure, a tribute both to the skill of the drilling crews, and to the quality of the pipe used."

Every foot of the drill pipe in the well is J&L Drill Pipe. To a depth of 13,655 feet, J&L Blue Ribbon Drill Pipe was used. From that point to the bottom, the string was replaced with J&L Blue Ribbon Vanadium Drill Pipe. Every foot of the wire rope which supports the entire four mile string of drill pipe is J&L Permaset Wire Rope. Hundreds of tons of J&L Casing have been set in the well, with additional hundreds of tons standing by for use when the well is completed.

To provide the high strengths needed in oil country tubular products for today's deep well drilling, J&L developed and has in operation extensive new finishing facilities—facilities which are already being expanded to keep pace with the oil industry's growing needs.

Interesting facts about world's deepest well

(As of November 28, 1955)

Total depth 22,209 ft., nearly 4¼ miles, equal to height of 15 Empire State Buildings . . . previous record depth 21,482 ft. . . . drilling began February 26, 1955 . . . total drilling time 205 days . . . total testing time 71 days . . . total elapsed time 276 days . . . bottom hole pressure 20,650 lbs. per sq. inch . . . bottom hole temperature 350° F. . . . time required to pull entire string of drill pipe to surface, replace bit and reset pipe is about 11 hours . . . stretch in drill pipe at extreme depth is about 20 feet . . . total cost of well estimated at between $1¼ and $2 million.

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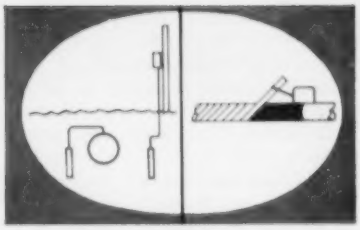

What the corrosion engineer can do for management

By GUY CORFIELD

IN 1951 Irving K. Peck, of The Manufactures Light and Heat Co. of Pittsburgh, delivered a challenging address entitled "What Does Management Expect of the Corrosion Engineer?" My disucssion is in a sense a reply to this challenge. It discusses the cost and danger of corrosion, and the possibilities of control. It outlines the various ways in which the corrosion engineer in the gas industry can perform useful services. It also reveals to management some of the corrosion engineer's problems, both technical and organizational, and solicits understanding, encouragement and assistance, so that the work can be carried out with maximum scope and effectiveness.

It would seem impossible to place a true value on the cost of corrosion to American industry and economy, or even to develop a basis on which costs could be evaluated. Beyond the direct loss of material, conservatively estimated to be one billion dollars a year for underground installations alone, there are the secondary effects of structural failure, interruption of operations, loss of products, general inconvenience, and sometimes plant or public hazard.

The gas industry with its varied operations, and facilities installed in practically every town and extending along every street in the nation, bears a heavy share of these corrosion costs, and can derive a proportionate benefit from their reduction. When a corroded pipeline of other structure requires replacement the cost of so doing, in material and labor, is sure to be more than the original cost and may be several times more. This presents a financial problem of increasing seriousness. Similarly the intangible costs of the secondary effects of corrosion, namely interruption of service, public inconvenience from street excavation, and occasional explosion damage, are increasingly costly to our industry's effort to maintain good public relations.

One of the elements that can be most costly, and most disturbing to management, is the rapidity with which corrosion can occur under some circumstances. For example, a pipeline laid without coating in corrosive soil could develop deep pits in four years time or less, and might require numerous leak repairs and even partial replacement in six years. Plant equipment, such as shell and tube heat exchangers, can suffer tube failure in one or two years.

While corrosion has taken a terrific toll in past years, there is no longer any need to accept it as an unavoidable expense and hazard of operation. Advances in technology, through research in both laboratory and field, have developed a basic understanding of causes and remedies, and the corrosion engineer is equipped and ready to apply mitigative measures. These measures may be a judicious selection and combination of materials; they may include the use of protective coatings; or they may involve the application of cathodic protection. In the case, cited above, of the bare pipeline which could develop leaks and require partial replacement in six years, the application of cathodic protection would arrest the corrosion and be expected to eliminate further operating difficulties substantially. If coating and cathodic protection were applied to this line at the time of installation, the repair and replacement expense would be avoided, the pipeline would remain in good condition, and the total cost of coating and cathodic protection during the six years would be a fraction of the replacement expense.

With this issue, GAS initiates the new Corrosion Prevention Department as a monthly "listening post" specifically for corrosion engineers and technicians. GAS' technical editor, Guy Corfield, will edit this department. He brings to it 25 years' experience in all phases of corrosion control work and has been active on AGA, PCGA, and other committees concerned with the subject. In addition, he is considered an outstanding authority on the use of plastics in gas industry operations.—Ed.

Function of corrosion engineer

There are a variety of ways in which the Corrosion Engineer can exercise or promote corrosion control, the most important of which are as follows:

1. Reviewing and making periodic tests and observations on existing installations to disclose corrosion before it becomes serious or results in failure, and developing mitigative measures or replacement schedules. Numerous test methods are available, which are relatively inexpensive, and do not damage the structures or interrupt operation. For example, ground-surface tests can be made on underground pipelines to check damaging current flow, and internal corrosion of piping or vessels can be determined by outside measurements of wall thickness, or by insertion and removal of coupons. Where corrosion is disclosed, it is often possible to prevent it by cathodic protection, coatings, inhibitors, etc.; and at all times its progress can be watched so that unexpected failure will not occur.

2. Recommending the types of coating, or other protective measures, that should be applied to new structures.

3. Recommending general design criteria for avoidance of installations or circumstances that will promote corrosion or make its control difficult. Some precautions that can be taken when possible are:

a. Avoiding galvanic couples, for example, copper-steel junctions in buried pipe; brass heat exchanger tubes in steel tube-sheets.

b. Avoiding combinations of oxygen, carbon dioxide, hydrogen sulfide and water in gas in contact with susceptible metals such as steel or copper or its alloys.

c. Avoiding cracks or inaccessible areas in metal structures, where corrosion and its products can accumulate and will be unobservable or difficult to eliminate.

d. Giving special attention to structures

exposed to excessive atmospheric moisture, corrosive sprays, etc.

e. Giving special attention and mechanical protection to coatings on buried pipelines laid in rocky areas, soil-stress areas, terrain which makes construction difficult, etc.

4. Where corrosion will be encountered if normal materials are used, recommending use of superior materials such as copper, stainless steel, etc., as over-all economies may indicate.

5. In difficult cases, where corrosion can be expected, attempting to find alternative design or location. For example, a buried pipeline can perhaps be re-routed around a particularly corrosive area, or installed aboveground.

6. Where corrosion is inevitable, recommending design whereby its progress can be watched, and the corroded members can be easily removed and replaced. For instance, if it is known that a tubular cooler or heat exchanger will corrode, select a design in which tube failure can be easily located, and install it so that replacements can be made without interference of adjacent structures.

7. Exercising continued surveillance over design plans, and construction jobs, to see that there is adherence to the above general rules and concepts. A designer may make changes or substitutions, thinking primarily of physical strength or other functions, and not realizing that he is setting up corrosive influences such as galvanic couples. On a field pipe coating job, the materials may be carefully specified and checked, but their effectiveness largely nullified if they are improperly applied and the pipe is carelessly installed. Enamels can be overheated; they may be poured over damp pipe which produces bubbles and poor bond; holidays may be left in the coating, or it may be damaged by skids or slings, or by lowering into the ditch, or in backfilling. This can be overcome if there is competent inspection on the job, and the inspector's task will be much easier if the construction workmen can be made to realize what is required and what are the consequences of improper installation.

In addition to these direct technical functions, the corrosion engineer can significantly further corrosion control activities in his organization by personal promotion and salesmanship. He can aid management by developing data showing the economic advantage of corrosion mitigation, and calling attention to situations that need correction. He can gain the understanding and assistance of the staff and operating supervisory personnel by informal personal contacts, willingness to attend and participate in meetings, assistance in developing job instruction data, etc. He can also obtain the cooperation and interest of the workman in the field by taking every opportunity to explain the need for corrosion control, why certain procedures and methods are specified, etc.

To be able to carry out these many functions the corrosion engineer must not only be capable and versatile, but he must also have the understanding and active support of management. If management has a corrosion control program in effect, or decides to inaugurate one, it should be realized that it must be a company-wide undertaking even though it may be nominally under the guidance and responsibility of the corrosion engineer. Therefore management should not only provide the necessary physical and direct personnel facilities for the corrosion engineer, but should also be sure that his status and responsibility are understood by other company personnel, and check periodically to see that he is receiving the necessary cooperation.

Specifically, management can help the corrosion engineer in a number of different ways, including the following:

1. Allowing him to have an adequate number of competent and properly trained assistants, together with appropriate testing facilities and instruments and means for their maintenance. The solution of a corrosion problem usually requires careful and detailed investigation and testing, and cannot be accomplished with inadequate equipment.

2. Seeing that the corrosion engineer's status, and opportunity for communication within his organization, is defined and adequate. He should:

a. Be permitted to participate in discussion of operating problems, design and redesign of structures, inspection of field construction, etc., so that he will be able to offer constructive suggestions and exercise a preventive function, rather than be called in later to apply curative measures.

b. Have his position within his organization clearly outlined, so that everyone knows his duties and responsibilities and that he has the authority to carry them out.

c. Be given reasonable authority to deal with engineers of other organizations, in problems such as cathodic interference so that he can make technical and financial decisions without delay and embarrassment.

d. Have access to leakage records, coating inspection reports, and other pertinent data so that he can evalute completely the pratical effectiveness of his corrosion control methods. Unless he has the opportunity to check operating data and results carefully, he may receive only partial and sometimes erroneous information on the performance of a coating or assembly he has recommended.

3. Not expecting immediate or complete elimination of corrosion in all situations that may arise. There may be circumstances over which the corrosion engineer cannot exercise early control, or where conventional means are not the complete answer. Operating necessity may dictate that only a partial remedy is practically or immediately possible.

4. Allowing funds for excavation and testing of old and new pipelines or get a better understanding of how existing coatings are performing, and thereby gather information for future specification writing.

5. Being receptive to experimentation and adoption of new materials and methods for corrosion control. While laboratory testing can indicate the probable valve of a new coating or technique, its true effectiveness can only be learned by actual field test.

6. Encouraging him to join associations and trade organizations such as American Gas Association, National Association of Corrosion Engineers, and local "electrolysis" committees, so that he can keep abreast of new developments and develop friendly acquaintance with others working in the same sphere of activities.

In conclusion, a recent item in *Business Week* magazine, by the Amercoat Corp., entitled "A Tribute to the Corrosion Engineer," seems to be very appropriate. It reads in part: "This man exists under many titles. In one plant he may be known as the corrosion engineer, in another the maintenance engineer, and in a third a metallurgist. But whatever his title, his duties are the same—he fights corrosion.

"Corrosion engineers work without fanfare. They fight corrosion with one or more of hundreds of materials and techniques they have in their arsenal of defenses. Their victories are quiet ones because like all preventive work, success is less conspicuous than failure.

"Corrosion engineers save industry many times their salaries. They reduce maintenance costs. They keep production costs down. They make possible the use of new processes and materials. They constantly improve the quality of products. All these benefits to industry are being achieved by a profession that is less than 15 years old.

". . . the achievements of the corrosion engineer are measured only in part by the millions of dollars he saves industry yearly. Indirectly, everyone in America profits through his contribution to better living. This man, who is so vital to the progress of industry, deserves the full support of management." ■

Fuel-starved Pakistan develops own gas supply

ON Nov. 9 the governor general of Pakistan opened the valve that formally started gas flowing into the fuel starved city of Karachi from the Sui gas fields, about 350 miles away.

The governor general commended the joint efforts of the national and foreign agencies that joined hands in the development of the scheme that saw completion of the project within 20 months of planning.

When the Indian Subcontinent was divided in 1947, the new state of Pakistan was left with very little in the way of natural fuel resources. With an ever increasing population due to the influx of refugees (Karachi, the capital city, has no less than four times its pre-war population), this was a matter of extreme seriousness. A little indigenous coal is mined but it is of poor quality, and two thirds of all coal used has to be imported. Industry in the country relies mainly on wood and imported fuel oil to keep in production, while domestic users take any fuel that may be available, including charcoal and camel-dung (the latter being specially processed for cooking purposes).

For many years exploration for oil has been carried out in India and when partition came, Pakistan Petroleum Ltd. intensified its campaign. By 1950 geological and geophysical surveys had been made in the Bughti tribal areas of Baluchistan, and after an aerial survey it was decided to start drilling at a place in the desert, many miles from any civilization, known simply as Sui. Named after a mud fort, it is a desolate, barren, and inhospitable area about 50 miles north of Jacobabad, which town itself has for many years been known as the hottest place on the subcontinent.

During the 19th century, traces of oil were found in this area, but attempts at commercial production were a failure because the petroleum traces observed mostly leaked away. And so, many years later, at a site not far to the south of the original oil shows, work started and the hitherto deserted waste became the focal point of tremendous activity. A camp was built to accommodate the engineers and other staff members engaged on the project. Water was pumped a distance of 36 miles from the Indus, and the camp was provided with a hospital and radio station. A new road was constructed to bring material from the nearest railhead at Kashmor, 32 miles away, and an airstrip was built nearby to enable men and materials to be quickly transported between Sui and headquarters in Karachi. By October 1951, about 5000 tons of equipment had been moved in and set up . . . and drilling commenced.

It soon became apparent that oil was not forthcoming, although traces of natural gas had been found from a depth of 4000 ft onwards. Tests were

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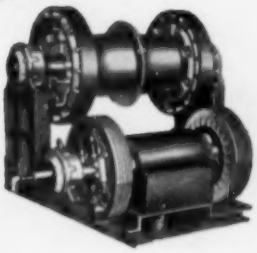

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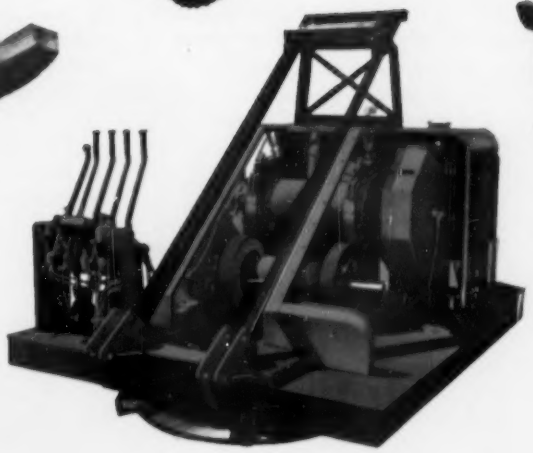

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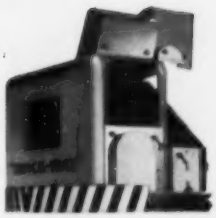

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Members of the Bughti tribe of Baluchistan, watch the gas flare at Sui, a strange sight in the desolate desert region of Pakistan.

made and a second well was drilled five miles away from the first. Still no oil was found, but the indications of large quantities of gas were again noted. In all, six wells were drilled and it became obvious that a natural gas field of vast capacity had been discovered.

To determine the extent and potential of this gas field, an American natural gas expert, C. S. Snodgrass, was commissioned to carry out an investigation and submit a report. As a result of his findings, it became clear that the vast reservoir at Sui could make available to Pakistan industry at least 100 MMcf of gas per day, for a period of not less than 60 years. The gas could replace much of the coal and fuel oil which have to be imported, and the wood now used so inefficiently in factory boilers, etc., could be diverted to other uses. The estimated annual saving is in the region of $22 million.

The major part of Pakistan industry is situated around Karachi and the problem was to get Sui gas to the factories. The only answer was, of course, a 350-mile pipeline.

To this end, the Pakistan Industrial Development Corp. and the Burmah Oil Co. (Pakistan Trading) Ltd. promoted the Sui Gas Transmission Co. Financial backing was given by The World Bank, Pakistan government public subscription, Colombo Plan, and Burmah Oil.

Chief function of the PIDC is to promote industrial development through government backing and by attracting private capital to key industries which are essential to an orderly and balanced overall development. Projects which it has sponsored include mills for jute, cotton ginning and spinning, woolen and worsted, paper and paper board, and sugar; ship repair facilities, cement plants, and synthetic fertilizer plants.

These projects are in addition to the many which have been initiated by unaided private enterprise. In the Punjab alone some 20 textile mills have been installed and are now in operation; others are under construction. The number of registered companies has risen from 2600 to more than 5000. This rapid pace of industrial achievement is reflected in comparing the 178,000 cotton spindles in 1947 with the 1,350,000 which are reported as either in, or practically ready for operation.

Gas has found, and will find, many outlets in Karachi. It powers a turbine in the PIDC shipyard, fires the billet reheating furnace at the General Iron & Steel Works, and is the source of Karachi's electric power—heating the

A shipment of 14-in. pipe being unloaded at Karachi's port on the Arabian sea.

water into steam used by the turbo-alternators, which generate electricity. Mills are using the fuel and it is anticipated that gas will serve as the raw material in the manufacture of synthetic fertilizers.

When the necessary financial backing was assured, the actual machinery of building a pipeline began. An aerial reconnaissance was carried out to ascertain the best route for the line. Desert, rivers, and rocky areas were surveyed by engineers traveling in jeeps, and, where necessary, by foot.

Men, materials and equipment began to arrive in Karachi in 1954. Approximately 60,000 joints of 14-in. OD pipe were produced by Stewart & Lloyds in Scotland and shipped from the Clyde. The line was built by two separate units. Starting in the middle, one spread worked north, the other south. Little difficulty was encountered in securing right-of-way as most Pakistanis were eager for the line to be put in.

Actual time taken to complete the line—surveying, clearing the land, stringing the pipe, trenching, welding, gamma-ray inspecting, cleaning, painting, coating and wrapping and trenching the pipe—was 165 days, representing an average of more than two miles per day. Work went on thoughout daylight hours, seven days a week and in *shade* temperatures ranging up to 110°F.

API 5LX-46 pipe, with its excellent welding and bending qualities in comparatively low wall thickness - - 5/16 in. and ¼ in., according to pressure designed to be carried in different sections of the Sui line - - was used.

A gas purification plant has been installed at Sui to remove the acid and moisture contents of the gas before it goes into the pipeline. Analysis of the gas taken from the wells showed that the hydrogen sulfide and mercaptan contents were fairly constant over the whole field, but the carbon dioxide contents varied from 4% to 8%.

The mercaptan content of the gas was considered to be acceptable for industrial and domestic purposes and a plant for the removal of hydrogen sulfide, carbon dioxide, and moisture only was proposed. Other considerations in the planning and designing of the plant were the probability of subsequent expansion and the necessity for providing standby capacity due to the corrosive nature of certain aspects of the purification process, and the remoteness of Sui from sources and supplies of engineering equipment and materials.

What is probably the largest and most modern radio-telephone system in Pakistan extends between Karachi and Sui. It is a frequency modulation, VHF system with 10 substations built along the pipeline route at intervals of 30 to 45 miles to provide direct telephone circuit between Karachi and Sui, and direct circuits between Karachi, Sui and three intermediate headquarters at Rohri, Daur, and Hyderabad. Both audio and teleprinting channels are used. It also provides telephone service to five intermediate repeater stations between the headquarters, terminal station, and gate valves. This radio telephone system enables pressure readings to be reported immediately to the gas control engineer. Also, any threat or damage to the pipeline can be brought to the notice of the maintenance engineers with the least possible delay.

The proved reserves in the Sui field are now estimated in the neighborhood of 4 million MMcf. They compare with the estimate of 2.5 MMcf made in 1953 when the first two wells were completed.

Of the total gas reserves in the field, 1.2 million MMcf have been dedicated to the operation of the Sui-Karachi pipeline. The remaining reserves of 2.8 million MMcf are available for further development.

One likely market for the additional gas is the power-starved, agricultural province of Punjab, lying northeast of Sui. For a balanced development of agriculture, upon which 80% of the 20 million population depend, and industry, basic sources of fuel and power are sorely needed to stimulate essential industrial developments, to pump water for irrigation, and to reclaim large areas of water-logged and saline lands for settlement by refugees. Current industrial production is throttled by rigorous coal and power rationing, which prevents further industrialization.

The estimated demand of three principal cities in Punjab — Lahore, the capital of West Pakistan, Multan, and Lyallpur—stands at 24.2 MMcf/day in 1955. On this basis, the demand would increase to some 36.5 MMcf/day in 1958 and to 73 MMcf in 1963. In addition are the fuel requirements of the thermal power plant and of the iron and steel works, which the government has approved for construction. ■

Gas-fired boilers being installed in new factories outside Karachi prior to the arrival of gas.

Side-boom bulldozer and team on the first weld of the Sui Transmission line.

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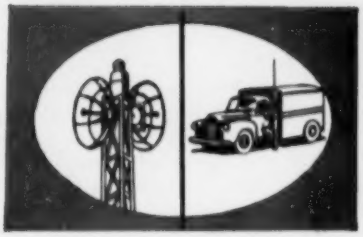


By FRANK CHAPMAN

Keller discusses growth of industrial radio

THE continuing demand for industrial radio communication facilities and the associated problem of frequency allocation was emphasized by Joseph E. Keller recently in his annual report to the Central Committee on Radio Facilities of the American Petroleum Institute. In making this point he made reference to a booklet recently published by the Federal Communications Commission in which it states that the "Safety and Special Radio Service" is the most prolific and active of all radio facilities in use today. The Industrial Radio Service, which includes the Petroleum radio licensing unit, is one of the most important of the services within this category.

The FCC booklet goes on to point out the basic problem which has developed because of this growth. It makes the statement that, "the fundamental problem with the Industrial Radio Services is, and always has been, how to make an equitable distribution of the limited number of frequencies available in such a manner as to provide the greatest good for the greatest number of persons." In his report, Mr. Keller emphasized the place that has been taken by the Central Committee in pursuing this fundamental problem, and the progress that the group has made in recent months in the interest of all Radio Communication Services.

One of the most outstanding single achievements aimed at the orderly expansion of the Industrial Radio service, according to Mr. Keller's report, has been in the field of microwave. "As new and better equipment has been developed, and the advantages and great potential of microwave realized," he pointed out, "microwave has reached the point where it has seemed feasible and practicable to recognize it as having developed beyond a so-called 'developmental' stage, thus justifying the establishment of a microwave rules service." He pointed out that in the spring of 1955 the FCC concluded a series of meetings looking toward the establishment of just such a service. The success of these meetings was in no small part attributable to the work of the Operational Fixed Microwave council, a group closely aligned with the Central Committee and its activities.

Mr. Keller also pointed out that the proposal on "split channel" operation, which the Central Committee initiated in 1954 in the hope of obtaining additional usage from the limited spectrum space within the Petroleum Radio service, has resulted in a proposal by the FCC which has been termed the most significant step in the non-broadcast field since the establishment of the Safety and Special services. The proposal was in the form of a petition requesting that the present 40 kilocycle channel separation in the 25-50 megacycle band be reduced to 20 kilocycle channel separation. Mr. Keller pointed out that "unquestionably the proposal represents the greatest step which has even been taken by the FCC to increase spectrum space, although at this stage, final accomplishment of the proposal likely will not be realizable until a relatively distant date, since many other considerations must be weighed before final action."

The FCC, according to Mr. Keller, has asked that comments be filed to its proposal which would reduce the channel separations not only for the 25-50 megacycle band, as originally suggested by the Central Committee, but also for the 152-160 megacycle band. The latter proposal by the FCC would reduce the present 60 kilocycle spacing to 15 kilocycle spacing with, however, assignments being made on an alternate 15 kilocycle basis so as to provide 30 kilocycle separation in the same local service area.

In filing its comments, he continued, the Central Committee referred to its original 1954 petition requesting substitution of 20 kilocycle separation for the present 40 kilocycle separation in the Petroleum Radio service, and pointed out that "tests conducted in connection therewith at the instance of the National Petroleum Radio Frequency Coordination Association, had clearly indicated the feasibility of operations within the 25-50 megacycle band, with 20 kilocycle separation." The comments stated:

"The Central Committee regards this proceeding as both essential and timely, and heartily endorses in substance, every proposal contained therein.

"Although the Central Committee's 1954 petition requested 20 kilocycle separation for only the Petroleum Radio service, the committee is, of course, well aware of the existent crowded conditions within the other radio services affected by this proceeding; accordingly, the Central Committee believes that this proposal will prove eminently beneficial for all these radio services, by providing much needed additional channels."

In his report, Mr. Keller pointed out that there are three primary theories or plans which are now being advanced in answer to the severely crowded conditions prevailing within presently allocated radio services. In addition to the "split channel" plan which he terms as a "feasible short-range plan, which would offer immediate help," there is the more extensive and complex plan

of geographical spacing and the "tremendously involved plan of overall reallocation of frequencies both in the broadcast and non-broadcast services." He continued that he thought that "in the not too distant future there will be some far-reaching developments in connection with this matter, which will involve very fundamental policy decisions."

Further reporting on activities of the Central Committee during the past year, Mr. Keller briefly discussed the study which is currently under way to explore the desirability and feasibility of forming a Mobile Radio Users association. Purposes of the association are: to represent user groups other than common carriers in solving common problems, to present consolidated user views to the FCC on regulatory matters common to member groups. Also, the conference would be a clearing house for engineering and operational ideas and practices that may be beneficial to all services, present consolidated user views to radio equipment manufacturers in efforts to obtain better and more efficient equipment and to promote understanding and cooperation between the various user groups.

The report continued to detail other matters with which the Central Committee has been concerned over the past year. Among them was included a report on technological advances in radio communication as outlined in the Committee's Two-Way Radio report. Also included was a report on a number of legislative and commission matters which have a bearing on Petroleum Radio Service licensees.

Motorola moves microwave products into new quarters

The microwave and industrial products department of Motorola's Communications and Electronics division has moved into new and expanded office, manufacturing and engineering quarters. Formerly located at the Chicago headquarters, this activity will now be centered in its own modern one-story building a few blocks away at 1400 N. Cicero Ave.

More efficient layout and improved materials handling methods incorporated in the new plant will greatly increase production capacity. Larger laboratory and systems engineering facilities are also provided.

GAS pipeline news

Certificate to import Canadian gas doubles Pacific's delivery capacity

From the paneled labyrinths of the FPC in late November came a certificate — a $514 million certificate in terms of gas industry expenditures— that carved a deep notch in the trunk of the natural gas business' development tree. Certificated were Pacific Northwest Pipeline's Corp.'s plans to connect with a Canadian pipeline company (Westcoast Transmission Co. Ltd.) and import natural gas from the prolific Peace river area fields to make the Pacific Northwest the first U. S. area to be served by a pipeline with major sources for natural gas at each end. Pacific's certificate means that the delivery of the exciting venture sponsored by a dynamic Houston (Texas) concern, the Fish Engineering Corp., has been about doubled before the Pacific Northwest Pipeline as initially certificated is even completed. Its impact will be felt by most of the gas companies in western United States and most of the Canadian companies—many are directly involved.

The history of the certificate allowing Pacific Northwest to import the Canadian gas constitutes a palimpsest of a gentlemanly brawl among Canada's Westcoast Transmission Co., natural gas-seeking California utilities, sprawling El Paso Natural Gas Co., and the infant Pacific Northwest Pipeline Corp. Others slipped into the ring to referee the match or to get in a blow at one or the other of the more active participants. A good deal of this background activity is known to readers of GAS (see GAS, October 1955, "The Scenic Inch" pp. 177 - 216).

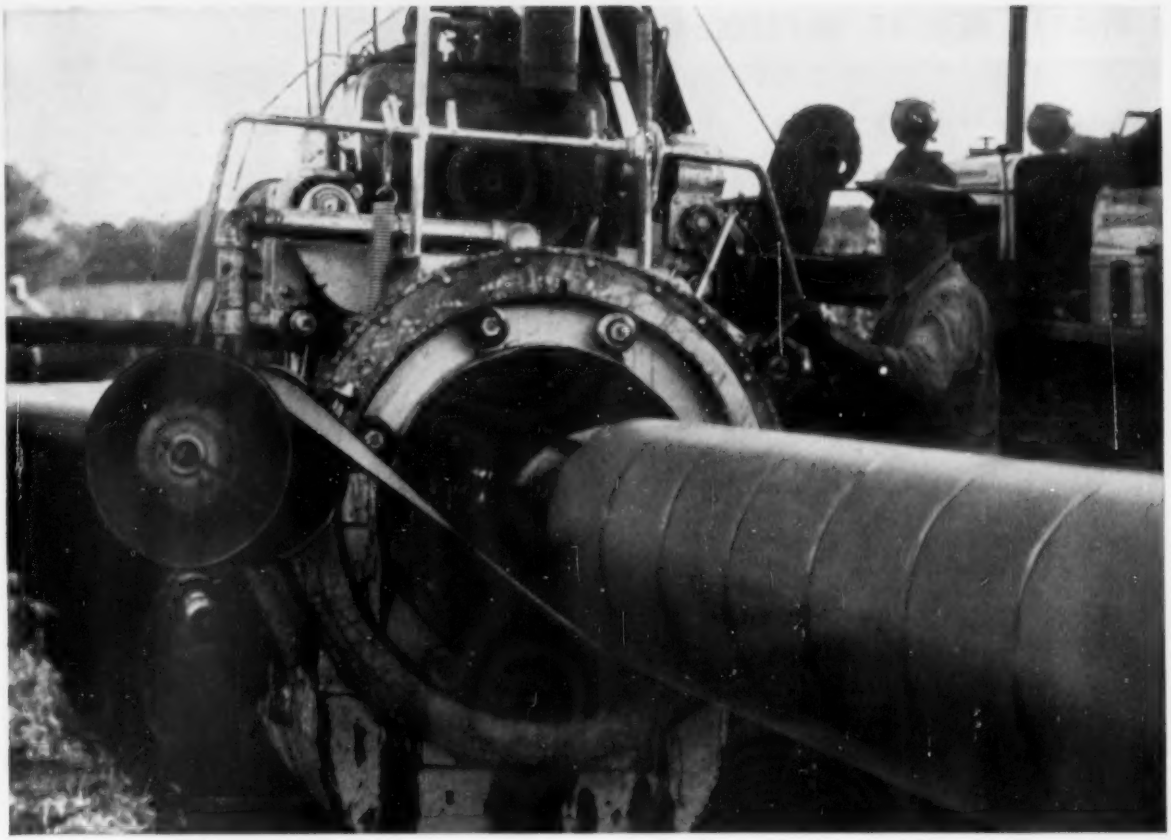
Pacific Northwest Pipeline Corp. was granted FPC certificate to build its Scenic Inch pipeline in June 1954. This initial system was to pick up natural gas in the San Juan basin and deliver it to the Pacific Northwest area terminating near Bellingham, Wash. Colorado Interstate Gas Co. was given permission to construct a tap line that would take gas from the Pacific Northwest line in Wyoming for delivery to Wyoming and Colorado markets.

Westcoast Transmission Co. wanted this market for Canadian gas, so it opposed Pacific's plans and was joined in this action by some of the Northwest area distribution companies. Paul Kayser's El Paso Natural also opposed the move by FPC to grant this certificate. The El Paso opposition was based on the assumption that it needs, or will need, San Juan basin gas to carry westward to the California companies—Pacific Gas & Electric Co. (San Francisco), and Southern California and Southern Counties Gas companies (Los Angeles). El Paso now pipelines natural gas to the California border for these and other companies, but it appears they cannot meet all of the demands from the California distributors.

Following the lengthy hearings, the granting of the certificate to Pacific Northwest and the associated plans of Colorado Interstate, and after turning down requests for rehearings from Westcoast Transmission and Trans-Northwest Gas Inc. came a December 1954 announcement that Pacific, Westcoast, and El Paso had entered into a three-party agreement whereby Pacific Northwest was to sell El Paso 250 MMcf/day from the new line at a point near Mountain Home, Idaho, and Westcoast would bring 300 MMcf/day to the Canadian border and sell it to Pacific to be used in the Pacific Northwest market picture. It is significant that the announcement of this deal originated from the Tulsa offices of Sunray Oil Corp. (now Sunray Mid-Continent)—a healthy backer of Westcoast Transmission Co.

All seemed to be satisfied with the agreements and peace reigned, but this idyllic state was not static for long.

Prior to the FPC hearings required to consummate the three-way agreement, El Paso threw in a tearing proposal to the effect that it did not want to limit its take-off point for gas from the Pacific line to the Mountain Home location. It suggested that Pacific Northwest sell the San Juan basin gas to El Paso in the San Juan basin, or the Mountain Home delivery point could be used and El Paso would then construct a line to a point near Reno, Nev. (not now served with natural gas, incidentally) where PG&E would accept delivery, or Pacific Northwest could deliver the gas to El Paso at Pendleton, Ore., where, again, El Paso would pipe-



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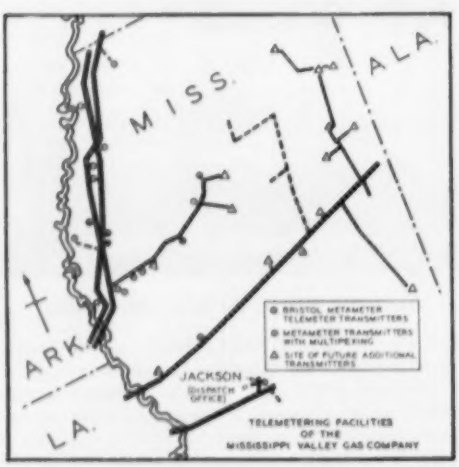
WHAT'S NEW AT BRISTOL

NERVE CENTER. Central dispatching office of Valley Gas, where dispatcher John Bonner checks the readings of pressure, flow, and temperature at 49 points in the company's distribution system on Bristol Metameter Receivers.

New telemetering system checks 49 functions by phone!



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line it to PG&E, the latter company picking it up at the northern California border. In all, six plans were developed for the interchange of gas among the three big companies involved.

In June of this year, Pacific Gas & Electric Co. peered down from its lofty perch, reared back, and issued forth with an intervention that blasted most of El Paso's plans. PG&E told FPC that its contract with El Paso called for delivery of 250 MMcf/day of gas from the San Juan basin and no other place. It was nakedly plain that they wanted no part of El Paso taking gas from Pacific Northwest at either Mountain Home or Pendleton for subsequent delivery to them at Reno, Nev. or Klamath Falls, Ore. Pacific Northwest, in turn, offered the fact that its commitment to El Paso called for delivery at Mountain Home and any other plan did not comply with the contract.

Colorado Interstate was anxious about the whole affair because its firm demand for 100 MMcf/day was based on certain prices of gas in the San Juan basin and it feared that if El Paso dipped too deeply into the San Juan basin gas the price from Pacific Northwest might be affected. Pacific Northwest depends on the delivery to Colorado Interstate to improve the price picture of gas supplied to the Pacific Northwest area of the U. S., so without the Colorado Interstate load these prices might be somewhat endangered. This discussion was even resolved to behind the scenes opinions that California wanted to grab the natural gas destined for Colorado. Interests in Colorado compared it to the situation of the maneuvers between Colorado and California over water supply that has caused some bad blood between the two proud states.

Under the certificate to Pacific Northwest issued Friday, November 25, 1955, the situation looks like this:

1. Pacific Northwest may purchase up to 300 MMcf/day of Canadian gas from Westcoast Transmission at the Canadian border. If both companies have their construction in, this delivery will start Jan. 1, 1959.

2. When Westcoast Transmission gets its line in — presently estimated to be about Nov. 1, 1957—the initial delivery to Pacific Northwest will be 200 MMcf/day prior to Jan. 1, 1958; 250 MMcf/day for one year after Jan. 1, 1958; and the 300 MMcf/day becomes a reality after Jan. 1, 1959 and is in force for the duration of the 20-year contract period.

3. Pacific Northwest can, upon 60-day notice, reduce the mentioned volume by 50 MMcf/day (during any of the periods, it is assumed) until Jan. 1, 1960.

4. Pacific has been given the option to purchase an additional 100 MMcf/day when it becomes available providing this volume is over and beyond the contract volume and Westcoast's requirements for service in Canada.

5. Pacific Northwest will pay $0.2225/Mcf for the Canadian gas delivered prior to Jan. 1, 1959, and $0.2200/Mcf thereafter. This price schedule is firm for the 20-year contract—no escalation provisions are included.

Pacific Northwest can now deliver 50 MMcf/day to El Paso Natural Gas Co. facilities. In addition, Pacific Northwest will exercise an option to deliver an additional 50 MMcf/day to El Paso. This makes 100 MMcf available to El Paso from PNW. It is presumed this gas is destined, in the main, for the California companies.

El Paso will take title to 50 MMcf/day of the Westcoast gas at the Canadian border, but the actual delivery by Pacific Northwest will be on a displacement basis at any point on the PNW pipeline designated by El Paso. Since PG & E seems reluctant to take gas delivered to El Paso at any point other than the San Juan basin, it seems likely that PNW will deliver to El Paso at that point.

The other 50 MMcf/day Pacific will deliver to El Paso will also be displaced or traded gas. El Psao will deliver 50 MMcf/day from its production in the Pinedale, Wyo. area to Pacific Northwest near the Big Piney field in Wyoming. El Paso will then take the equivalent volume from Pacific in, it is presumed, the San Juan basin.

El Paso will pay Pacific $0.03/Mcf more for the Canadian gas than the approved rate at the Canadian border.

The vast El Paso Natural pipeline system delivery will be expanded by 455 MMcf/day. Of this natural gas, 177 MMcf/day will be delivered to Southern California Gas Co. and Southern Counties Gas Co. (both of Los Angeles) near Blythe on the California border. Another 177 MMcf/day will be delivered to Pacific Gas & Electric Co. (San Francisco), probably at Topock, Ariz. Nevada Natural Gas Pipe Line Co. will take 30 MMcf/day from El Paso, and the remaining 71 MMcf/day will be available to El Paso's other customers in Arizona, New Mexico, and Texas.

El Paso will have to spend $194 million in new facilities to its system to permit delivery of this increased volume. FPC permission to make these improvements was granted them at the same time the importation of Canadian gas was approved.

The FPC certificate to PNW for the importation of Canadian gas means that the initial pipeline system will be expanded even before it is entirely completed. The mainline will have to be extended to the Canadian border near Sumas, Wash. with 26-in. OD pipe. The diameter of 399 miles of mainline from Umatilla, Ore. to Bellingham will be increased to 26-in. OD. In the Spokane area, a new lateral to Lewiston and Clarkston will be built; another will be put in to serve Coeur d'Alene; and a third will extend to the Canadian border to supply natural gas to Trail, B. C.

Pacific will export natural gas to Trail and also to the Vancouver, B. C. area. The supply to Vancouver will be used by British Columbia Electric Co. until the Westcoast Transmission pipeline can be completed to that point. Pacific will also export gas to Inland Natural Gas Co. Ltd. of British Columbia for resale to Consolidated Mining and Smelting Co. of Canada Ltd.

These additional deliveries will mean that pipe diameters will have to be increased, metering facilities constructed, pressure regulating stations constructed, compressor horsepower increased, etc. This will be done for about $28,611,456 or about one-fifth of the cost of the initial Pacific Northwest Pipeline Corp. system.

A $514 MILLION CERTIFICATE?

The certificate frees plans for the following expenditures:	(In millions)
1. To expand Pacific Northwest's pipeline facilities	$ 28
2. To expand El Paso's pipeline facilities	194
3. To expand Nevada Natural Gas Co.'s facilities	4
4. To construct Westcoast Transmission's facilities	153
5. Additional expenditures in Canada—distribution systems, appliances, conversions, etc.	90
6. Canadian drilling activities	45
Total	$514

Huge gas reserves purchased by Northern

Purchase of ½ trillion cu ft of natural gas reserves and negotiations for another ½ trillion have been announced by Northern Natural Gas Co., Omaha.

In his quarterly letter to stockholders, Northern's president, John Mer-

riam, said new gas reserves were purchased from United States source, because "The confused Canadian natural gas picture has been further complicated and we have eliminated any reliance upon such source of supply to meet the 1956/ . . . requirements."

The letter stated that although the company has made the recent large purchases of U.S. gas, Northern still is interested in obtaining a long-range supplemental supply of Canadian gas. In the event the purchase of gas from a Canadian pipeline at the border south of Winnipeg proves impracticable, Mr. Merriam said, "Northern can on a competitively priced basis construct its own direct pipeline to the southern Alberta gas fields through North Dakota and Montana to obtain any exportable surplus of gas available . . ."

TGT's connection to new reserves okayed by FPC

Texas Gas Transmission Corp., Owensboro, Ky., has received FPC authorization to construct new pipeline facilities to connect its system with additional natural gas reserves in Louisiana. The decision (Docket G-8809, et al) also grants certificates to three independent producers to sell gas to TGT.

Texas Gas' $19,969,000 project consists of a 105-mile supply line from the East Lake Palourde gas field in Assumption parish, La., where gas will be purchased, to its system near Eunice, La. TGT will also construct loops paralleling sections of its system in Arkansas, Mississippi, Tennessee, Kentucky, and Indiana, and add compressor facilities totaling 19,190 hp.

The new facilities will be used to serve the increased firm requirements of its customers estimated at 108,589,000 cu ft/day.

Brooklyn and Long Island in joint construction plan

Brooklyn Union Gas Co. and Long Island Lighting Co. have joined in plans to construct a $5 million, 24-mile line through Brooklyn and Queens and in Nassau to Garden City which will increase BU's gas supply to the eastern end of its territory and provide additional gas for Long Island Lighting. Construction of the line will start in the spring and is scheduled for 1957 completion.

The PSC has approved the project and has agreed to waive a rule in its safety code that prohibits high-pressure lines within 100 ft of buildings on condition that many safeguards be taken. Among these will be careful laboratory tests of the pipe used for the line, half of which will be 26-in. and the rest 24-in.

The whole system will be tested before going into operation under air pressure 150% over the 350 psi for which it will be designed.

Northern Natural Gas Co.'s new suspension bridge crossing the Missouri river at a point near Plattsmouth, Neb., carries two 30-in. pipelines. The bridge, representing an investment of more than $1 million, is the biggest on Northern's system and carries 4808 ft of natural gas pipe across the river.

Almost complete recovery of oil reserves possible

Almost complete recovery of oil reserves is theoretically possible, new laboratory tests show, according to Thomas V. Moore, head of the production research department of Esso Research & Engineering Co. At this time about half of the original oil is being recovered. He said this figure has been reached as the result of technological advances over the past 25 years.

Among new techniques being seriously studied, Mr. Moore cited the use of solvents such as LPG. Under favorable conditions, recoveries in the order of 80% might be obtained in practice, he said.

Two production techniques known as "water drive" and "gravity drainage" were described by Mr. Moore when he spoke at the API's annual meeting recently, as among the most efficient means of obtaining high recovery today.

PG&E would increase system capacity by 25%

Pacific Gas & Electric Co., San Francisco, has asked the California PUC for approval of a $20,686,000 project to increase by 25% the daily volume of gas it imports from out-of-state fields.

Currently receiving 700 MMcf/day from Texas and New Mexico fields, PG&E seeks to increase its supply by 875 MMcf in a four-stage development which would begin Nov. 1, 1956 and end by Jan. 1, 1959. Deliveries to PG&E from the El Paso (Texas) Natural Gas Co. would increase 50 MMcf daily by Nov. 1, 1956; another 75 MMcf daily by Nov. 1, 1957; another 25 MMcf by Jan. 1, 1958; and the final 25 MMcf by Jan. 1, 1959.

To carry the increased deliveries, the company would build 149.6 miles of 34-in. pipe paralleling sections of its Super Inch line from Topock, Ariz., north to Milpitas, Calif. With other loops made in 1953 and 1954, this would result in all but 70 miles of the 502-mile line having parallel sections.

Additional compressor capacity totaling 9260 bhp would be added to the Topock, Hinkley, and Kettlemen stations, raising their total to 76,120 bhp.

North Dakota PSC blocks operation of gas line

A series of orders issued by the North Dakota PSC has apparently blocked operation of a gas transmission line from Tioga to Minot, N.D. built by Montana-Dakota Utilities Co., Minneapolis.

Montana-Dakota was scheduled to appear before the commission late last month to show cause why it should not be held in contempt of the commission for building the line without PSC authorization.

The order issued by the commission also provided that Montana-Dakota be prepared to begin an extension of its system to Fargo by June 1958 and to Grand Forks by June 1960. Both cities are in a market area sought by Tennessee Gas Transmission Co. and Midwestern Transmission Co. (see GAS, December, p. 122).

Conditions imposed by the PSC would require Montana-Dakota to renegotiate with Amerada Petroleum Corp. and Signal Oil & Gas Co. to obtain a lower price for natural gas it would buy from the two firms. Montana-Dakota should not pay more than 12 cents per Mcf, the commission declared, which present contracts call for a delivery price of 16 cents per Mcf the first five years plus 1 cent more each five-year period thereafter for 20 years.

Nevada Natural Gas Co. to parallel facilities

The recent FPC authorization permitting Pacific Northwest Pipeline Corp. to import Canadian gas from Westcoast Transmission Co. also included an authorization for Nevada

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Natural Gas Pipeline Co. to take an additional 30 MMcf per day from the El Paso Natural Gas Co., its current supplier, for a total daily delivery of 50 MMcf. The certificate clears the way for Nevada Natural to parallel the entire length of its current pipeline from the California-Arizona border to Las Vegas, Nev.

Nevada Natural's domestic and industrial load in the Las Vegas area has grown rapidly since the completion of the company's original 114-mile, 10-in. line early in 1954. Deliveries to Nevada Southern Gas Co., distribution company for the city of Las Vegas, and to the industries in the area have shown a phenomenal rise since the line has been in operation.

The pipeline company has agreed to supply a maximum of 28 MMcf per day to the Southern Nevada Power Co. for a steam generating plant near Las Vegas. First unit of the plant is already in operation with a second unit scheduled for completion before the end of the year. In addition, the line is to be extended 21 miles to supply gas to the industrial area of Blue Diamond, 14 miles southwest of Las Vegas.

In addition to the city of Las Vegas, the pipeline company supplies gas to California-Pacific Utilities for distribution in the city of Henderson, Nev.; and the Citizens Natural Gas Co. recently franchised distribution company for Boulder City, Nev.

The newly certificated loop line will be 12- and 16-in., and will increase the system's total deliverability to about 60 MMcf per day. Construction is expected to get under way in early 1956, with completion before the end of the year.

Field price formula fails court test

The field price formula used by the FPC in pricing company-produced gas by Panhandle Eastern Pipe Line Co. has been ruled "invalid because not properly related to the public interest by the evidence and findings." The United States court of appeals for the District of Columbia made this ruling in setting aside the commission's action, and remanded it to the FPC "for further proceedings not inconsistent with this opinion."

In the same opinion, the court disagreed with the action of the FPC in the same case in failing to credit to revenues of the company the profits from its gasoline extraction operations in computing the revenues to recovered by Panhandle's rates.

It sustained the commission, however, in its treatment of accelerated amortization.

Although the court did not specifically limit the commission to the use of a cost basis for determining the price of Panhandle's own-produced gas, nor did it necessarily prohibit the use of the field price method, it declared that "allowance of the fair field value of Panhandle's own produced gas as an operating expense is not here supported by the evidence and findings to be in the public interest."

However, the court did state that although it held that the cost method "not to be the only one available under the statute, it is essential in such a case as this that it be used as a basis of comparison. It has been repeatedly used by the commission, and repeatedly approved by the courts, as a means of arriving at lawful—'just and reasonable'—rates under the Act. Unless it is continued to be used at least as a point of departure, the whole experience under the Act is discarded and no anchor, as it were, is available by which to hold the terms 'just and reasonable' to some recognizable meaning."

Under whatever formula the commission may use, the court emphasized, it must never lose sight of the fact that always "relate its action to the primary aim of the Act to guard the consumer against excessive rates."

The court stressed that, should the

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When the new units are placed on the line, the enlarged station will handle 24 mmcfd. Residue gas from the main plant will be picked up at 2000 psig and boosted to 4000 psig for injection into the reservoirs. As field operating conditions change, CVOC personnel will install new outer head plugs furnished with the units. The station will then be capable of compressing 29 mmcfd from 2500 psig to 4500 psig.

This on-the-job modification to the compressors will permit the production of the reservoirs to their final stages without compressor cylinder change. No additional operating personnel will be required as the units have been equipped with automatic controls that permit their unattended operation except for scheduled maintenance. Highly salvable, the entire installation can be moved to other service when the Justiss Reservoirs are depleted.

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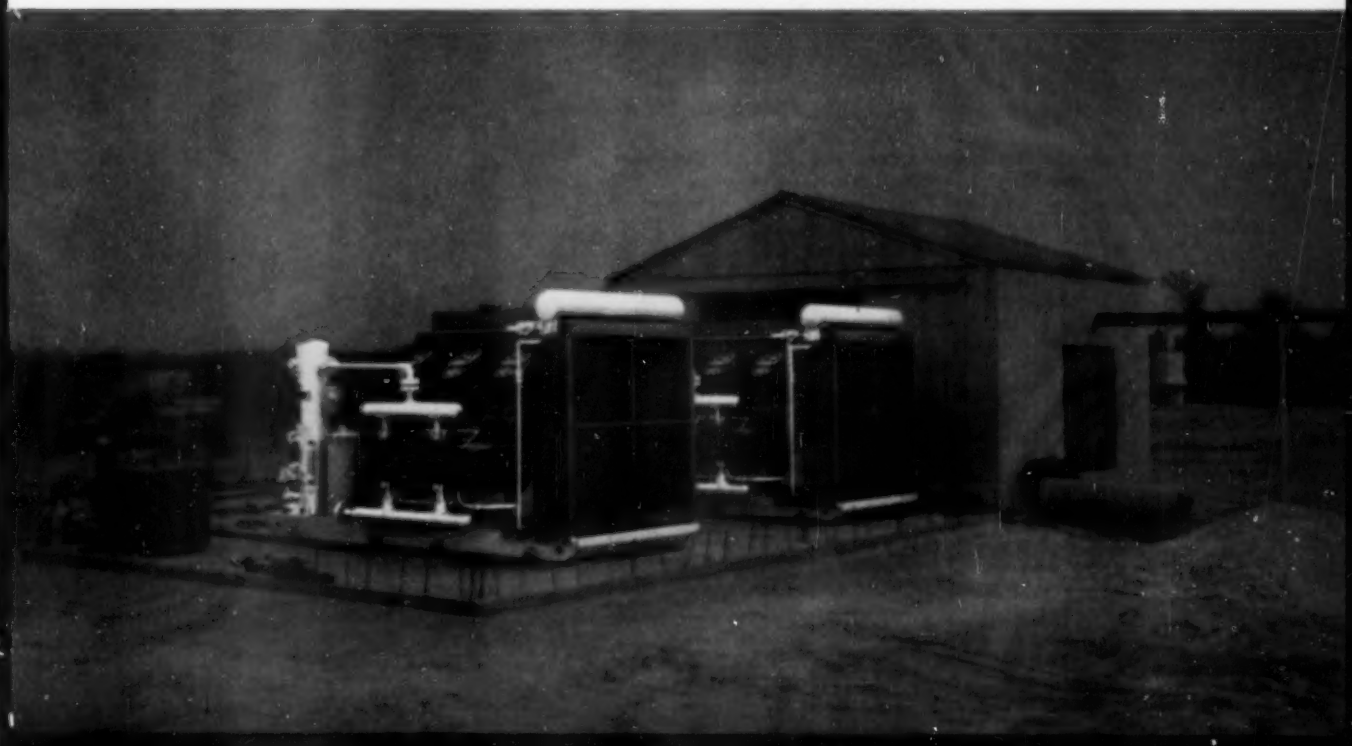

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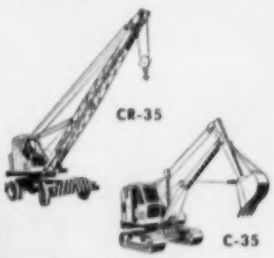

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pipeline news • *Cont'd.*

FPC seek to supplement the record and findings consistently with the views hereinabove expressed, the commission in such proceedings, "should also consider the impact" of the Phillips decision "upon its stated reasons for desiring to encourage pipeline companies to produce their own gas." Citing the extent of the jurisdiction given the commission under that decision over rates of all gas going into interstate commerce, regardless of who it is produced by, the court commented: "The effect of the decision will probably be to subject to federal regulation the prices paid by pipeline companies for most of the gas they purchased. Consequently, the question of indirectly influencing these prices by the means here chosen by the commission, such as augmenting the bargaining power of the pipeline company, may be considerably affected."

June 7, 1954 rate is effective rate, rules FPC

Where an independent producer has filed a rate that actually was being paid on June 7, 1954, and the FPC has accepted such rate for filing, the commission has ruled that such rate is the effective rate and such filing constitutes compliance with Order 174-A, but does not constitute a determination of the proper contractural rate or the just and reasonable rate.

This position was taken by the commission in an order reversing a decision of a presiding examiner, who had recommended that the $41,000 bond currently posted by the Dorchester Corp. in connection with its pending rate changes should be increased to $742,000.

In its order reversing the examiner, the FPC ruled that, for purposes of complying with Order 174-A, a 9.8262-cent-per-Mcf rate filing made by Dorchester in 1954 in connection with a sale to Natural Gas Pipeline Co. of America, which price Natural was actually paying on June 7, 1954, is the effective price, even though the price in the contract was stated at 6.253 cents per Mcf. It was noted that the higher price was called for under the Oklahoma minimum price order, which was declared invalid by the Supreme Court. The examiner had recommended the higher bond on the theory that the lower rate was the effective rate in view of the court's action and language used by the commission in an order of Nov. 30, 1954, as to what the effect of subsequent invalidation of the Oklahoma court by the court might be.

In its Nov. 30, 1954 order, the com-

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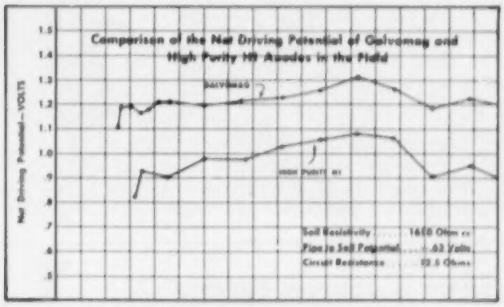

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mission had stated that it would accept the 9.8262 cent rate filed by Dorchester, but the question of whether that price is the effective price as of June 7, 1954 for this sale "is dependent upon whether the (Oklahoma minimum price order) is valid as to such sale."

However, in its order reversing Examiner Zwerdling, the FPC said "it is now clear that the precautions which we attempted to take were improper and of no avail. There can be only one filed rate under which a particular sale may be made. The rate which was filed was the 9.8262-cent rate, which was the rate which was actually effective and was being paid by Natural to Dorchester's predecessor on June 7, 1954. Therefore, this filing complied with our Order 174-A."

The commission added that "a policy of accepting rate filings tentatively, subject to later and final acceptance of the rate we found to be the proper one, would be unworkable administratively, and would be of questionable legality . . .

"The fact that the 9.8262-cent rate was paid under protest, or that a lesser amount was paid for a while shortly thereafter, or that the basis for the 9.8262 rate (the Oklahoma minimum price order) subsequently has been determined to be invalid or any other facts pertaining to the equities between the parties does not require or permit us in this proceeding, to determine what the lawful or the just and reasonable rates should have been on June 7, 1954. The 9.8262-cent rate was the 'effective rate' on June 7, 1954, within the meaning of Order No. 174-A."

The commission made it clear that it was not determining the justness or reasonableness of the "effective rate," but rather that it determined this rate filing "constitutes compliance with our order."

In approving the $41,000 bond, the commission concluded that "we have no power to award reparations and cannot fix rates retroactively. Consequently, our authority to require Dorchester to reduce rates or refund to Natural is limited to the period commencing on March 1, 1955, when the suspended 10-cent rate became effective, subject to refund under bond."

TGT acquires financial interest in Trans-Canada

Tennessee Gas Transmission Co. is acquiring about a one-third interest in Trans-Canada Pipe Lines Ltd., and will become an equal partner with the interests behind Canadian Delhi Petroleum Ltd. The latter is original organizer of Trans-Canada and the sponsor of Western Pipelines Ltd., which has been absorbed by Trans-Canada.

It is expected that when financing of the Canadian line is done, the participants up to that time will take common stock to the extent required to cover their expenditures. All the remaining stock is to be offered to the public.

Vent gas gathering system in operation at Herscher

The vexing problem of leakage at the Herscher, Ill., underground storage project (see GAS, August, p. 107) has been solved with the completion of the vent gas gathering system, which makes it possible to gather and reinject the gas being released.

The $1.5 million gathering system consists of 4.2 miles of pipe of varying sizes connected to 25 field vent wells and two water disposal wells. It also has a desulfurization plant for removing hydrogen sulfide from the gas, a cooling tower, and other installations.

The system has sufficient capacity to collect up to 17 MMcf of gas daily, which is substantially more than the maximum quantity of gas vented on

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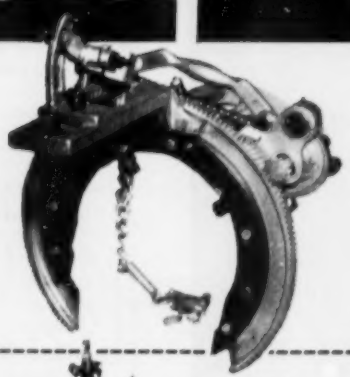

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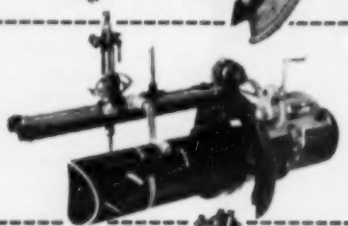

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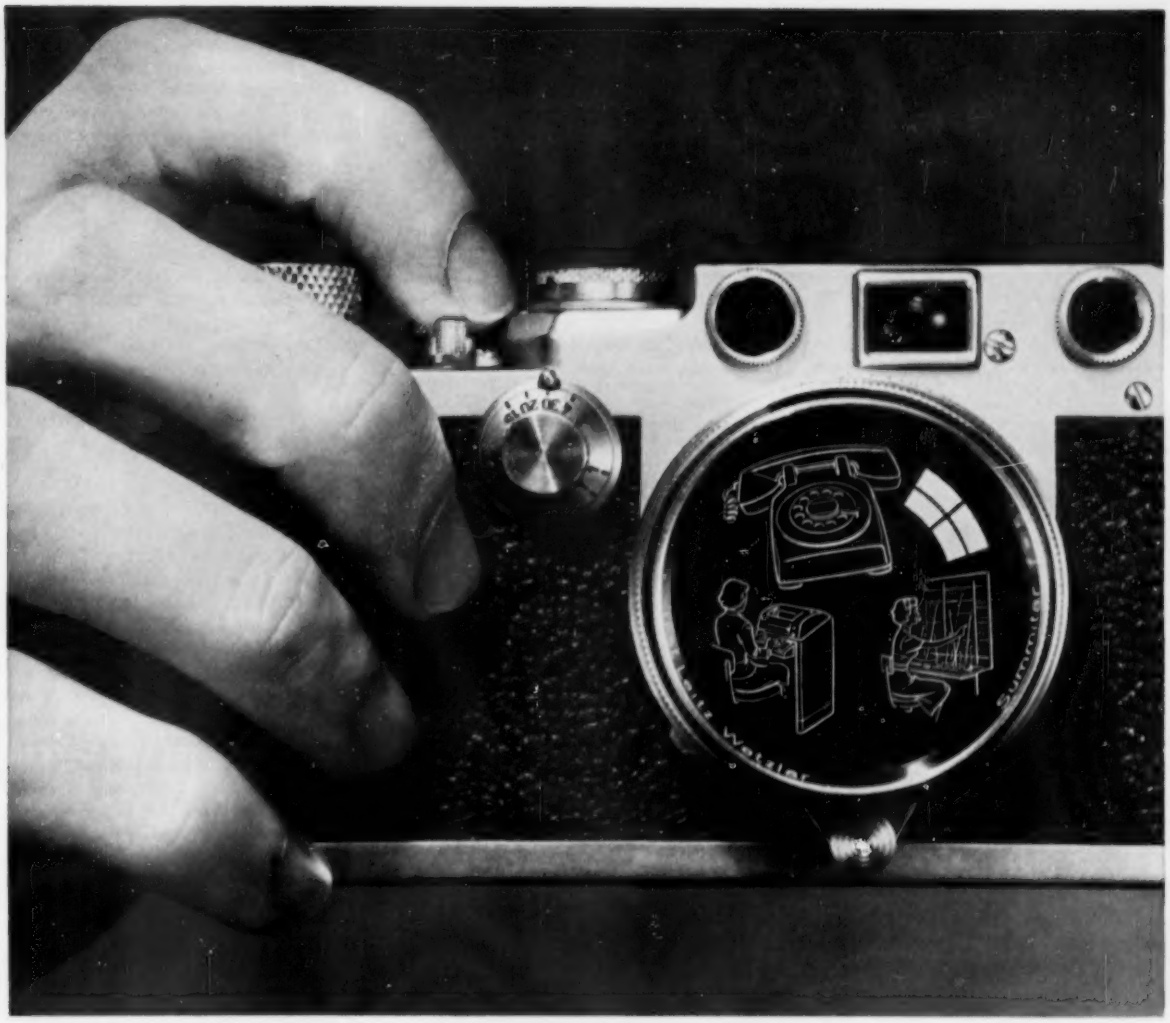

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pipeline news • *Cont'd.*

any day since the field was placed in operation.

Natural Gas Storage Co. of Illinois performed the developmental work for the storage project and owns and operates the field and its facilities.

FPC asks for 10-cent/Mcf rate in Cities Service case

The FPC has issued certificates authorizing Cities Service Gas Co., Oklahoma City, to construct new pipeline facilities, and granting authority to Signal Oil & Gas Co., Los Angeles, an independent producer, to make sales of natural gas to Cities Service (Dockets G-2569 and 2570).

Signal's certificate was granted, however, upon the express conditions that the company file within 30 days a rate of 10 cents per Mcf for its sales to Cities Service, in substitution for its proposed 12-cent rate. The commission held that the companies "have failed to demonstrate that a rate level of 12 cents Mcf is necessary in the public interest or that the public convenience and necessity which requires the issuance of this certificate dictates a finding that a rate of 12 cents is necessary to ensure the economic feasibility of the project." The commission said that "we wish to clearly state that in conditioning the order . . . to provide for a rate of 10 cents/Mcf, we do not find that this rate is the just and reasonable rate within the meaning of Section 4 of the (Natural Gas) Act."

The sales to Cities Service are now being made at Signal's gas processing plant in Carter County, Okla., under a temporary certificate issued by the FPC. The commission, pointing out that the present maximum price in this area of Oklahoma is 10 cents/Mcf, said that the price proposed by Signal "would inevitably cause a general price increase for all major sales to 12 cents . . . as a result of future purchases of new supplies of gas."

The FPC's action authorizes the construction by Cities Service of a 15½-mile pipeline to transport gas purchased from Signal's Carter County gas plant to Cities Service's existing facilities in Garvin County, Okla. Estimated cost of the Cities Service's existing facilities is $541,050. Cities Service initially will purchase 30 MMcf of gas per day from Signal.

FPC Presiding Examiner William J. Costello filed a decision last June granting the certificates, but he refused to include a rate condition in his order.

The commission said that Signal's contentions that the FPC does not have the power to impose a rate condition "are without merit," and declared that it "has long followed the practice of imposing rate conditions where appropriate in granting certificates . . . and the power to do so has been upheld by the courts." Furthermore, the commission continued, there is no basis upon which to distinguish this power with reference to "independent producees" certificates, and the exercise of such power with reference to an "interstate pipeline company."

The FPC also described as "erroneous" Signal's argument that the fact that its rate schedule in connection with a temporary certificate was accepted for filing removes the rate from the commission's power to condition. Acceptance of rate schedule for filing does not indicate approval, the Commission declared, but rather is a procedural matter wherein the person or company involved is informed that the filing satisfies the formal requirements of the FPC's regulations.

"Unless and until a record is made which will support this increase (over the prevailing field price)," the Commission asserted, "we should not countenance such an unsupported rate increase." The FPC pointed out that its action does not foreclose Signal from filing any rate increase "which it may

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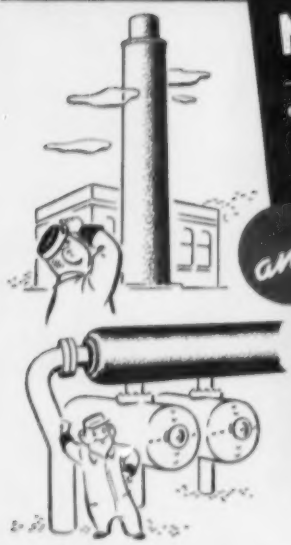

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The condition had been urged by two interveners — Oklahoma Natural Gas Co. and Lone Star Gas Co.—and by the commission's staff. The two intervening companies, which purchase natural gas in the same area, argued that the proposed 12-cent rate would "trigger" price increases under favored-nation clauses in gas purchase contracts.

The commission said that the certificate condition would "hold the line" at least "until experience and time have given us the opportunity to develop more comprehensive criteria governing determination of rates of independent producers."

Chairman Jerome K. Kuykendall and Commissioner Seaborn L. Digby dissented and filed separate opinions.

Commissioner Digby stated that he would grant the certificate to Signal without the price condition. Declaring that all the precedents relied upon by the majority have been drawn from interstate pipeline cases, Commissioner Digby said that "The use of such precedents in dealing with the independent producers seems very questionable even assuming that Section 7(e) (of the Natural Gas Act) is so broad as to authorize us to fix an initial rate by a condition in a certificate in lieu of a rate proceeding under Section 4."

He said that in the producer application "we do not require and thus we do not have the information upon which to ground a finding as to what would be a reasonable and just initial rate as we have in the pipeline applications." Since the commission does not have any criteria developed as to the proper approach to rate-fixing for independent producers, he said, "it is clearly unfair to a producer applicant to tamper with the contract that was arrived at as a result of arm's-length bargaining."

Commissioner Digby further declared that "In view of all of the circumstances in this case, I think that the price condition in the Signal certificate does not qualify as a reasonable condition under Section 7(e) and that the legality of such a condition is doubtful."

Chairman Kuykeldall, who said he was in general agreement with Commissioner Digby's opinion, indicated that he believes the entire Natural Gas Act is applicable to producers as a matter of law.

He said that "When sales are made by a producer, under either permanent or temporary authority, pursuant to a filed rate schedule, I know of no way by which the applicable rate can be reduced by the commission other than through proceedings under Section 5. I am unable to find the source of the power which the majority purport to exercise in fixing the 10-cent rate," he added. "Virtually all state and federal laws relating to powers of regulatory agencies recognize that such an agency does not and cannot have the knowledge or ability to devise an initial rate, and the power to suspend such a rate is therefore withheld," he declared.

Gas bill target of gas company council

Proponents and opponents to the Harris-Fulbright bill to exempt natural gas producers from federal legislation are rallying for the pending Senate debate.

More than 40 gas utilities from coast to coast have joined the information program of the Council of Local Gas Companies, aimed at defeating the proposed amendment to the Natural Gas Act, according to John Heyke, president of Brooklyn Union Gas Co. and chairman of the council. The local gas companies will seek support in their own states and from their own customers in opposing the Fulbright bill. A Washington office has been established by the council.

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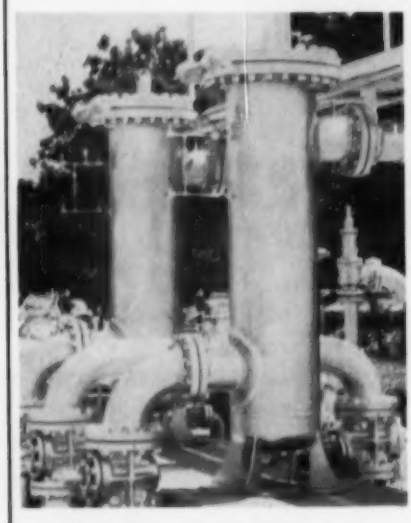

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"All of us who recognize in the Fulbright Bill the threat of endless increases in gas prices believe it is our duty to familiarize our customers, the 26 million families who have invested more than $12 billion in gas appliances, and the general public with the issues," Mr. Heyke said. "However, unlike the oil interests supporting the measure, we haven't at our disposal limitless funds for a national campaign. We are reassured by the number of companies who have decided to join our ranks on the basis of the facts themselves."

As to the council's plans, it has no aim but to make gas users aware that amending the Act "could easily cost them a total of well over $800 million a year," Mr. Heyke declared. "A lot of fog has been created by proponents who advocate the bill as essential to 'preserve the free enterprise system.' All gas utility companies are subject to public regulation, and we don't consider ourselves any less free enterprisers because of it.

"If price checks are removed from our suppliers by the Fulbright amendment, however, we will lose the freedom to maintain our competitive position with other fuels. We will be forced to pay whatever the gas producers ask, and to reflect such increases in our rates to our customers."

Speaking out against the council, French Robertson, president of the Texas Mid-Continent Oil & Gas Association, suggested that users of natural gas in eastern states "look closer to home for explanation of their fuel bills." He termed the council a "group of big utilities who are looking for whipping boys on which to blame their high prices."

The pro-Harris-Fulbright faction is using as its argument the supply and production of gas. If the bill is not passed, producers have said they will concentrate on markets within the producing states. It is reported that the Texas Co. has said "new commitments . . . to interstate pipelines have been shelved" since the FPC claimed jurisdiction over producers.

The controls have had "a deterrent effect on the ability to buy gas and has caused increases in purchase prices," the New York Society of Security Analyists was told recently by James F. Oates Jr., chairman of Peoples Gas Light & Coke Co. While producers' claims may be exaggerated, he said it may be some time before natural gas will be available in "substantial quantities" if the bill is not passed.

State conservation bodies have authority to cut back allowable production quotas in the interest of conservation of natural resources, but John Heyke doesn't believe that this will happen. Even if producers request such

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The TAPECOAT Company

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cutback, he said, "it is inconceivable . . . that the government of any state would be willing to sacrifice the interests of 20 million Americans in order for a small group of companies to grab additional millions of dollars."

Offshore gas line to tap Louisiana gas supply

Two parallel undersea pipelines, one a 30-in. gas line, will be built to tap the offshore Louisiana production. Offshore Gathering Corp., Houston, has asked the FPC for a certificate of necessity to construct the gas portion, which would carry gas from the producing areas eastward to the Mississippi coast.

The crude oil line, approximately 800 ft away from the gas line, would carry crude westward to the Port Arthur-Beaumont refining area and/or eastward to Mississippi.

In general, the lines would run eastward from the Texas side of the Sabine river about 25 miles offshore from Louisiana, ending on the Mississippi side of the Pearl river.

Estimated costs of the project are: gas line, $96.5 million; oil, $51 million; recovery plant, $9.8 million.

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GAS pipeline notes

Under FPC authorization (Docket G-9083), United Fuel Gas Co., Charleston, W. Va., will sell its storage pool X-56 and related transmission line to Atlantic Seaboard Corp., also of Charleston, for $1,073,547. The pool is located near Seaboard's 26-in. Cobb, W. Va.-Baltimore line near its Cleveland compressor station in Upshur county. Peak-day withdrawals are estimated at 25 MMcf.

Texas Gas Corp. has additional gas reserves totaling 14 MMcf under two new 20-year contracts, according to President Russell M. Riggins. Texas Gas will construct necessary gathering facilities in the Marrs McLean and Phelan fields upon receipt of FPC approval.

Five million cu ft of gas per day is being produced by what experts predict may turn out to be one of the largest oil fields in the country—the New World Oil & Uranium-Max Pray Government No. 1 wildcat near the Rangely field in the Uintah basin of Utah.

Ball Associates, oil and gas consultants in Washington, D. C., have opened new offices in Denver. New members of the staff are Alan M. Bieber, Richard H. Fulton, and Alexander S. Wyner.

Iron Ranges Natural Gas Co., St. Paul, Minn., proposes to spend $2.8 million to build (Docket G-9648) a 68-mile transmission system and approximately 47 miles of supply laterals to various towns and cities on the Mesabi iron range in Minnesota. Capacity of the proposed system would be 55 MMcf/day, which Iron Ranges plans to obtain from Midwestern Gas Transmission Co., Houston.

Commissioner Seaborn L. Digby has been re-elected to serve as vice chairman of the FPC during 1956. Commissioner Digby has been a member of the commission since August 1953.

Public Service Co. of Colorado will sell its holdings of Colorado Interstate Gas Co. stock—256,503 shares—and will turn the proceeds into its current construction program, which will require some $110 million in the next four years. The stock was acquired by Public Service in 1931 and is carried on its books at a cost of $1,875,014. At present CIG dividend rates, Public Service is netting about $300,000 a year from its stock.

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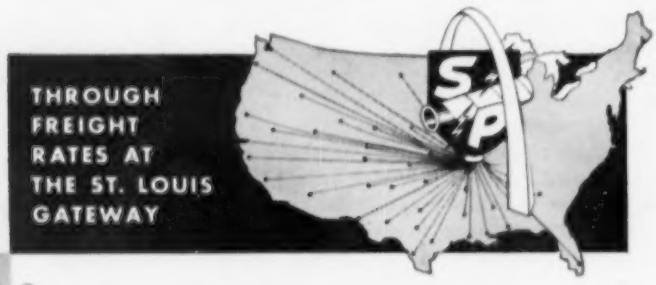

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GAS pipeline people

R. D. Grimm

W. A. Strauss

Northern Natural

R. DEAN GRIMM has been appointed to the newly created position of manager of gas reserves and availability in Northern Natural Gas Co.'s gas supply department. He has been assistant manager of the gas reservoir department of Phillips Petroleum Co. The company has also named W. A. STRAUSS director of its newly established certificate department.

JACK CLARKE has resigned as director of public relations for Texas Eastern Transmission Corp. to become executive vice president of Freestate Industrial Development Co., a planned industrial development operation in Louisiana.

JOE B. GIBSON has been appointed special representative, line pipe projects, in the Tubular Products division of Jones & Laughlin Steel Corp.

JAMES C. BELL has joined the engineering staff of Corrosion Services Inc., Tulsa, where he will work on the design of cathodic protection systems for pipelines.

A. H. Weyland

J. C. Hamilton

Arkansas Louisiana

A. H. WEYLAND, president of Arkansas Louisiana Gas Co. since 1945, has been elected chairman of the board of directors. J. C. HAMILTON, senior vice president, was elevated to the presidency. The board also elected JAMES C. TEMPLETON a vice president of the company and M. D. LAGRONE as assistant secretary.

JOSEPH F. WEILER has been appointed attorney in charge of the legal department of Texas Eastern Transmission Corp., Shreveport. He will supervise the activities of that department.

WILLIAM H. BARNES, formerly district manager of Clark Bros. Co. Tulsa office, has been elected vice president and general sales manager of the C. Lee Cook Co., Louisville, Ky.

M. V. COUSINS and C. C. BARNETT have been elected vice presidents of United Gas Pipe Line Co. Mr. Cousins has been a member of the board since last March while Mr. Barnett was elected to the board at a recent meeting.

W. M. ELMER has been elected a director of Texas Gas Transmission Corp., Owensboro, Ky. Mr. Elmer is senior vice president of the company in charge of financing, sales, gas supply, production, and regulatory matters.

EDWARD C. KOCH has succeeded the late E. A. PHOENIX as manager of the Johns-Manville market surveys department.

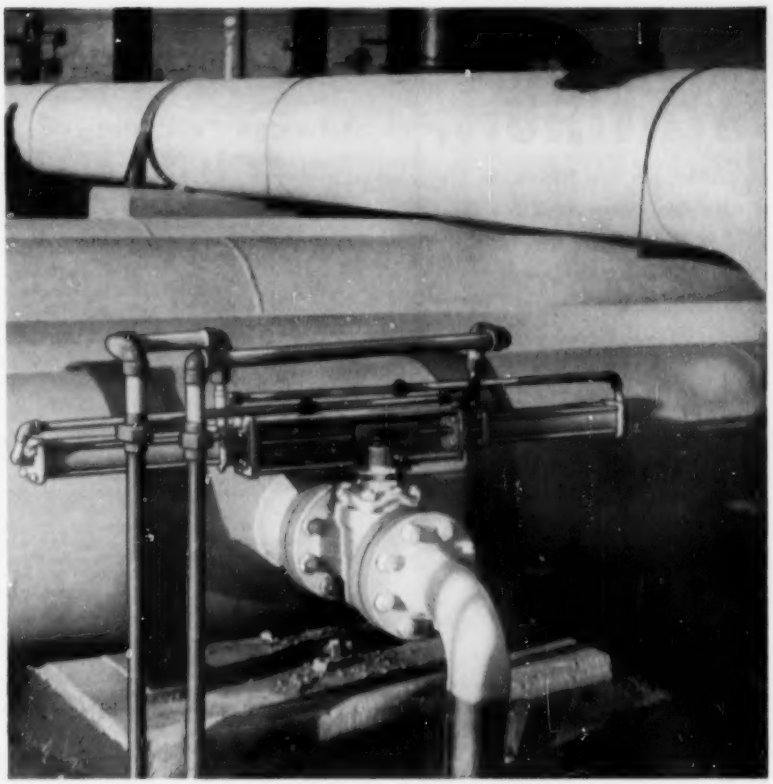
R. C. Smith

A. K. Hegeman

Clark Bros.

Clark Bros. Co., Olean, N. Y., has appointed ROBERT C. SMITH as California district manager. A. K. HEGEMAN, Clark vice president and until now California district manager, will continue in the Los Angeles office as consultant until his retirement in September. The company has also appointed CHARLES M. MICHELSON district manager of its Tulsa office.

A. F. SCARR is the new assistant to the vice president and general manager of Kaiser Steel Corp., assuming the position of JACK J. CARLSON, who was recently elected vice president.



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GAS progress reports

NEW CONSTRUCTION PLANNED

IRON RANGES NATURAL GAS CO., St. Paul. Docket G-9648 to build 68-mile transmission line and 47 miles of supply laterals to various towns and cities on the Mesabi iron range in Minnesota.

PACIFIC GAS & ELECTRIC CO., San Francisco. To build 149.6-mile, 34-in. line paralleling Super Inch from Topock, Ariz., to Milpitas, Calif., and add 9260 hp at Topock, Hinkley, and Kettleman stations.

CURRENT CONSTRUCTION

AMERICAN LOUISIANA PIPE LINE CO., Detroit. Docket G-2306 to construct 1289 miles of line—30-in. from North Tepetate, Acadia parish, La., to connect with Michigan Consolidated facilities near Detroit; 24-in. to feed into 30-in. line in Louisiana, also three 10,000-hp compressor stations. Not included is the 117-mile, 22-in. line to extend from Payne, Ohio, to Bridgman, Mich., to connection with Michigan Wisconsin Pipe Line Co. Price has completed 10 miles of 185 contracted for.

ARKANSAS LOUISIANA GAS CO., Shreveport. Docket G-2307 for 134 miles of 6⅝- to 24-in. line in 11 sections, and 10,500-hp compressor station on its system in Arkansas, Louisiana, and Texas. Compressor station and 71 miles of line completed.

COLORADO INTERSTATE GAS CO., Colorado Springs. Docket G-2121 - (1956 program) 249 miles of 22-in. line from Denver to connection with proposed Pacific Northwest Pipeline Corp. line at Green River, Wyo.; with 4400-hp compressor station near Green River.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-9138 for 12 miles of 30-in. line beginning at Boom compressor station in Tioga county, Pa.; thence running parallel to existing 20-in. line to Lindley, N. Y. Pipe Line Construction & Drilling Co. now at work.

NEW YORK STATE NATURAL GAS CORP., Pittsburgh. Docket G-9073 for 8.84-mile, 12¾-in. line beginning at point where TGT's line crosses Niagara Mohawk Power Corp.'s line near Brookview in Schodack, Rensselaer county, N. Y., to North Greenbush, N. Y. Hartford Bros. now at work.

PACIFIC NORTHWEST PIPELINE CORP., Houston. Docket G-1429 for 1466 miles mainline; 443 miles of spur and lateral lines; and 14 mainline compressor stations totaling 81,120 hp and 2 booster stations totaling 4620 hp, to extend from Ignacio, Colo., in the San Juan basin, to Bellingham, Wash. (Seattle area). Fish Northwest Constructors Inc., builders of the line, have let contracts to River Construction Corp., R. H. Fulton & Co., Associated Pipeline Contractors, A. J. Curtis Construction Co., B. & M. Construction Co., Midwestern Constructors Inc., H. B. Zachry Co. and Fulghum Construction Co. for first 1061 miles. Completion scheduled for fall of '56. As of October, about 443 miles of mainline and 71 miles of gathering and lateral lines had been lowered in.

PANHANDLE EASTERN PIPE LINE CO., Kansas City, Mo. Docket G-2433 for construction of 294.5 miles of mainline loops, 137.3 miles of lateral loops. The 137.3-mile laterals are being constructed under a temporary FPC permit.

TENNESSEE GAS TRANSMISSION CO., Houston. Dockets G-2310, G-2330 and G-2331. Construction is well advanced in Pennsylvania, New Jersey, and New York on a 250-mile, 24-in. line from Hebron (Pa.) storage field to Greenwich, Conn., and an 18-mile 24-in. Hebron to Harrison storage field plus 36 miles of 26-in. loop in Ohio have been completed. Development of two more storage fields—Colden near Buffalo; Harrison, in Potter county, Pa. Construction is underway at Isola, Miss., and at Morehead, Ky., on new compressor stations. Company is constructing 370-mile, 30-in. line from Agua Dulce, Texas, to Kinder, La., along Texas and Louisiana Gulf Coast line (Docket G-8215).

TEXAS EASTERN TRANSMISSION CORP., Shreveport. Docket G-2503 for 377 miles of line, 91,400 hp in new compressor stations, and 36,020 hp additions at existing stations—all to be located in Texas, Louisiana, Mississippi, Tennessee, Kentucky, Ohio, Pennsylvania, and Alabama. Compressor stations remain to be completed this winter.

UNITED GAS PIPE LINE CO., Shreveport. Docket G-8230 for 62 miles of line in Mississippi, Alabama, and Florida; 21-mile, 20-in. loop serving Pensacola 40% completed by Western Pipe Line Inc.; 34-mile, 16-in. line, Baxterville to Petal, Miss., 70% completed by Panama-Williams Corp.; 7.3-mile line 65% completed by Berry Construction Co. Additions to compressor stations 45% completed by Joe R. Turner.

WESTCOAST TRANSMISSION CO. LTD., Calgary. To build 650-mile 30-in. line from Peace river area to near Vancouver, B. C., to connect with line of Pacific Northwest Pipeline Corp., to transport 300 MMcf of gas daily. Work has begun on the Fraser Valley section, a 110-mile line from Huntingdon to Merritt.

APPROVED

CENTRAL KENTUCKY NATURAL GAS CO., Charleston, W. Va. Docket G-8600 to build 14.2-mile, 24-in. line from Cold Springs to Anderson Ferry, Ky.; a two-line 2550-ft crossing of Licking river; a two-line 3575-ft crossing of Ohio river; a 3.9-mile, 20-in. line near Means, Ky.

TEXAS GAS TRANSMISSION CORP., Owensboro, Ky. Docket G-8828 for 189 miles of line and 20,270 hp in compressor capacity along its system in Louisiana, Arkansas, Mississippi, Tennessee, Kentucky, and Indiana.

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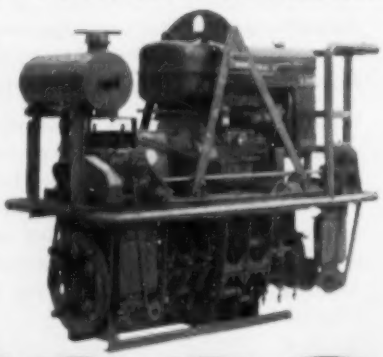
This versatile pipe cleaning and priming machine can be used for line traveling operation or with stationary base (shown at right) for yard cleaning and priming—either way it is better built and more efficient to give you faster, trouble-free service. Crose cleaning and priming machines are available for all sizes of pipe including 36"



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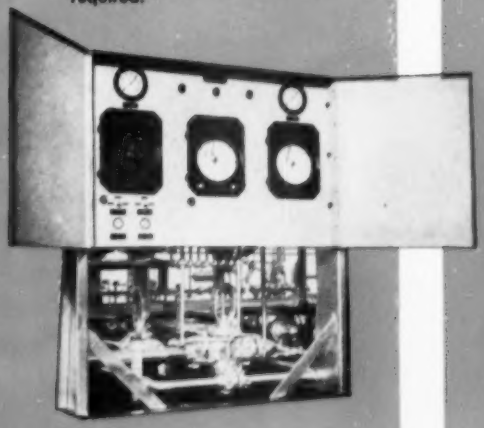

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- ✓ Exclusive BS&B compartmented dual horizontal sorbers make possible a more compact design, with reduced unit cost and installation time.
- ✓ Transverse gas flow through sorbers results in greater efficiency and longer desiccant life.
- ✓ All instruments for the completely automatic continuous operation of the unit are housed in a weatherproof cabinet.
- ✓ No outside power sources are required.
- ✓ Unit includes famous BS&B Salt Bath Heater for proper regeneration gas temperatures at maximum safety.
- ✓ BS&B three-way valves, used in cycling the sorbers, reduce the piping required and make possible a more compact unit.
- ✓ Convenient platform between sorbers provides an easy method for loading or replacing desiccant.
- ✓ Units can be "custom-sized" to meet your requirements.

For More Information On The BS&B Model DDH Dehydrator, Contact Your Nearest BS&B Representative, or write to . . .

BLACK, SIVALLS & BRYSON, INC.

Oil & Gas Equipment Division, Dept. 1-BQ1

1708 West Main Street — Oklahoma City, Oklahoma

EFFICIENCY · OVER 60 YEARS · BS&B · RELIABILITY

ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

HEART OF THE METER . . . .

SPRAGUE DIAPHRAGMS

Formed from a solid piece of the finest quality lambskin, specially tanned, vacuum oiled, cemented and tied to metal flanged rings, Sprague Diaphragms retain their tightness and flexibility for continuous low differential operation. By using genuine Sprague parts you reduce maintenance costs and keep the original equipment efficiency that Sprague builds into its products, thus assuring more profitable operation.

THE *Sprague* METER COMPANY

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